ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT SCOPING REPORT

PROPOSED GAROB WIND ENERGY FACILITY PROJECT, LOCATED NEAR COPPERTON IN THE NORTHERN CAPE PROVINCE

(DEA Ref: 14/12/16/3/3/2/279)

DRAFT FOR PUBLIC REVIEW

07 June 2012 to 09 July 2012

Prepared for:

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/279
Title	:	Environmental Impact Assessment Process Draft Scoping Report: Garob Wind Energy Facility Project, located near Copperton in the Northern Cape Province
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Project Developer	:	Garob Wind Farm (Pty) Limited (a juwi Renewable Energies (Pty) Ltd initiative)
Report Status	:	Draft Scoping Report for public review
Review Period	:	07 June 2012 to 09 July 2012

When used as a reference this report should be cited as: Savannah Environmental (2012) Draft Scoping Report: Garob Wind Energy Facility Project, located near Copperton in the Northern Cape Province

PURPOSE OF THE DRAFT SCOPING REPORT

juwi Renewable Energies (Pty) Ltd is currently undertaking an Environmental Impact Assessment (EIA) process to determine the environmental feasibility of a proposed wind farm on a site near Copperton in the Northern Cape Province. juwi Renewable Energies (Pty) Ltd has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

Scoping is an important part of the EIA process, as it helps to ensure that the impact assessment is appropriately focussed. The main objectives of the Scoping process are:

» To engage with stakeholders at an early stage of the development so that they may contribute their views with regards to the proposed project;
» To identify potential issues and impacts associated with the proposed development;
» To define the scope of the Environmental Impact Assessment (EIA);
» To define the methodology that is required for the EIA; and
» To describe the plan of study for the EIA.

In terms of NEMA, the Scoping Report is submitted to the competent authority (i.e. the National Department of Environmental Affairs (DEA)) as part of the decision-making process with regard to the proposed wind farm. The Scoping Report is also intended to provide sufficient background information to other Organs of State, non-statutory bodies, the general public, organisations and local communities in order to obtain their commentary and input on the proposed development. The Scoping Phase of the EIA process identifies and describes potential issues associated with the proposed project, and defines the extent of the studies required within the EIA Phase of the process. The EIA Phase will assess those identified potential environmental impacts and benefits associated with all phases of the project including design, construction, operation and decommissioning, and will recommend appropriate mitigation measures for potentially significant environmental impacts.

The Scoping Report consists of eleven sections:

» **Chapter 1** provides background to the proposed wind farm project and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** describes wind energy as a power option and provides insight to technologies for wind turbines

- **Chapter 4** provides a description of the processes followed in the determination of acceptable sites for the development of the proposed Garob Wind Energy Facility Project
- **Chapter 5** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
- **Chapter 6** describes the existing biophysical and socio-economic environment
- **Chapter 7** describes the activities associated with the project (project scope)
- **Chapter 8** presents the evaluation of environmental impacts
- **Chapter 9** presents the conclusions of the scoping evaluation
- **Chapter 10** describes the Plan of Study for EIA
- **Chapter 11** provides a list of references and information sources used in undertaking this Scoping Study.

The Draft Scoping Report provides the public with an opportunity to verify that all potential issues associated with the proposed project have been identified through this scoping study, and provides an opportunity for additional key issues for consideration to be raised. The Final Scoping Report will incorporate all comments received prior to submission to the National Department of Environmental Affairs (DEA).

INVITATION TO COMMENT ON THE DRAFT SCOPING REPORT

Members of the public, local communities and stakeholders are invited to comment on the Draft Scoping Report which has been made available for public review and comment at the following locations from **07 June 2012 to 09 July 2012.**

» www.savannahsa.com
» Siyathemba Public Library
» Alpha Library
» Alkantpan Lodge

Please submit your comments to
Gabriele Wood of Savannah Environmental PO Box 148, Sunninghill, 2157 Tel: 011 234 6621 Fax: 086 684 0547 E-mail: gabriele@savannahsa.com
The due date for comments on the Draft Scoping Report is **09 July 2012**

Comments can be made as written submission via fax, post or e-mail.

SUMMARY

Garob Wind Farm (Pty) Limited is proposing the establishment of a wind energy facility and associated infrastructure on an identified site located near Copperton in the Northern Cape Province of South Africa. The proposed site is located within the Siyathemba Local Municipality (within the Pixley ka Seme District Municipality), approximately 10 km east of the town of Copperton, and ~35 km south west of the town of Prieska (see **Figure 1**). This proposed project will be referred to as the **Garob Wind Farm**. This development is proposed to comprise a cluster of up to 55 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed within an area of approximately ~5520 ha in extent. The developer for the wind energy facility for Garob Wind Farm is **juwi Renewable Energies (Pty) Ltd.**

Associated infrastructure proposed includes:

» Wind turbines of between 2 – 3.5 MW in capacity
» Concrete foundations to support the turbines
» Cabling between the turbines, to be laid underground where practical, which will connect to an on-site substation
» An on-site substation to facilitate the connection between the wind energy facility and the electricity grid
» A new overhead power line. Two power line options are proposed; Option 1 would be to connect to the existing Burchell Caprum 132 kV power line that crosses the site while Option 2 will be to connect to the existing Eskom Caprum substation approximately 8 km from the site.
» Internal access roads to each turbine (approximately 6 m in width) linking the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible
» Workshop area / office for control, maintenance and storage

The scoping phase for the proposed project forms part of the EIA process and has been undertaken in accordance with the EIA Regulations. The Scoping Report aimed to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving specialists with expertise relevant to the nature of the project and the study area, the project proponent, as well as a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

A comprehensive public participation process is being undertaken in accordance with Regulation 54 of Government Notice No R543 of 2010 during the Scoping phase of this EIA process. This public participation process comprises the following:

- Notification of the EIA Process in printed media and on site, as well as through written notification to identified stakeholders and affected landowners.
- Identification and registration of I&APs and key stakeholders.
- Compilation and distribution of a Background Information Document (BID) to all identified I&APs and key stakeholders.
- On-going consultation with identified I&APs and stakeholders, including Telephonic communication, Focus Group Meetings and one-one-one meetings.
- Compilation and maintenance of a database containing the names and addresses of all identified I&APs and key stakeholders.
- Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process.

The overarching objective for the wind farm planning process is to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. Local level environmental and planning issues will now be considered within site-specific studies to be undertaken as part of the EIA for the project. The assessments through the EIA process will assist in delineating areas of environmental sensitivity within the broader site and ultimately inform the placement of the wind turbines and associated infrastructure on the site in order to minimise impacts on the environment.

The potentially sensitive areas/environmental features/issues that have been identified for the site (as shown in **Figure 2** for further study) include:

- **Drainage lines within the site:** There are a number of drainage lines that occur on the site. These are considered to be of high sensitivity. According to the National Water Act, dry stream beds and drainage areas (including non-perennial streams) are classified as wetlands or water resources. Drainage lines/ non-perennial streams provide habitat for a number of plant/animal species in the study area, including those with a restricted distribution or species with an elevated conservation status. Drainage lines (water resources) represent particularly vital natural corridors as they function both as wildlife habitat, providing resources needed for survival, reproduction and movement, and as biological corridors, providing for movement between habitat patches. The drainage lines and pans shown in the desktop sensitivity map have been mapped at a desktop level. The actual extent will be mapped from field work during the next phase of the assessment.

» **Potential habitat for protected flora and fauna:**
The gravel or stony outcrops on site are likely to be dominated by low woody shrubs. These are likely to be of medium ecological sensitivity due to higher plant and animal diversity. This will however be verified in the field work during to be conducted in the next phase of the assessment.

» **Potential bird sensitive areas:**
The proposed facility could have an impact on selected avifauna species resident to the surrounding area. A possible impact of the facility will be displacement effects on, and collision mortality on selected avifaunal species. These priority species may be disturbed by the construction of the wind energy facility, and/or lose foraging habitat (in terms of the area covered by the construction footprint), and/or sustain mortalities in collisions with, or electrocution on the new power infrastructure. Surface water areas on site have been identified as potential habitats for avifauna and should be avoided.

» **Noise sensitive Receptors**
The construction and operation of the wind energy facility will have potential impacts on noise sensitive receptors within the proposed development. The buffer around these receptors will be recommended during the EIA phase based on site conditions (to be verified in the EIA phase).

The sensitivity map is a rough scale estimate of sensitivity on the site, and these areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase.

In order to connect the renewable energy facility to the power grid, two connections options are proposed.

» Option 1: to connect to the existing Burchell Cuprum 132 kV power line that crosses the site
» Option 2: to connect to the existing Eskom Caprum Substation approximately 8 km from the site.

Potential issues associated with the proposed overhead distribution power lines will include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

The power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred alternative alignment and appropriate mitigation measures).

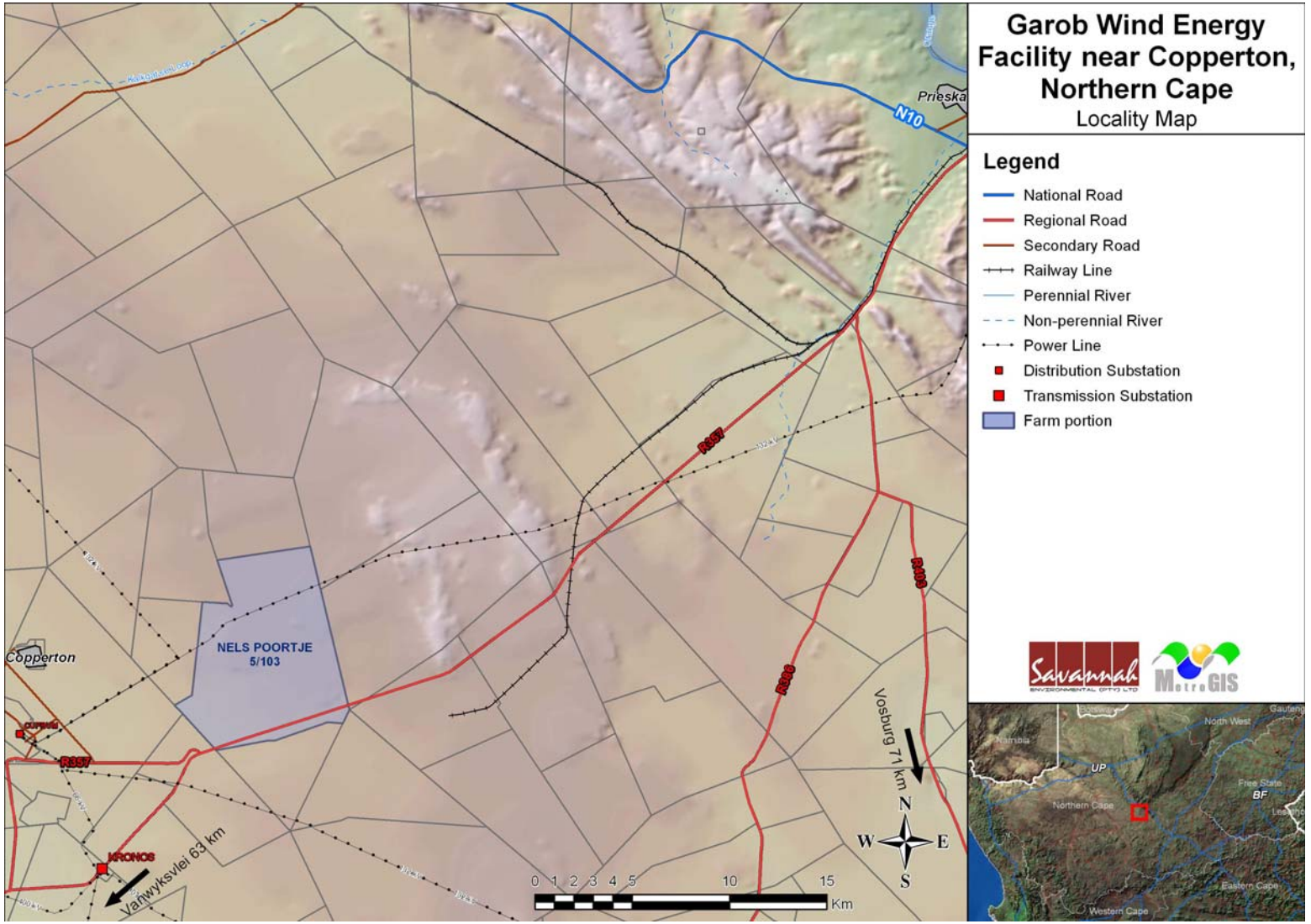

Figure 1: Locality map showing the study area for the establishment of the Garob Wind Farm located on Nelspoortje Farm, portio 5 of the Farm 103, located in the Siyathemba Local Municipality (Northern Cape

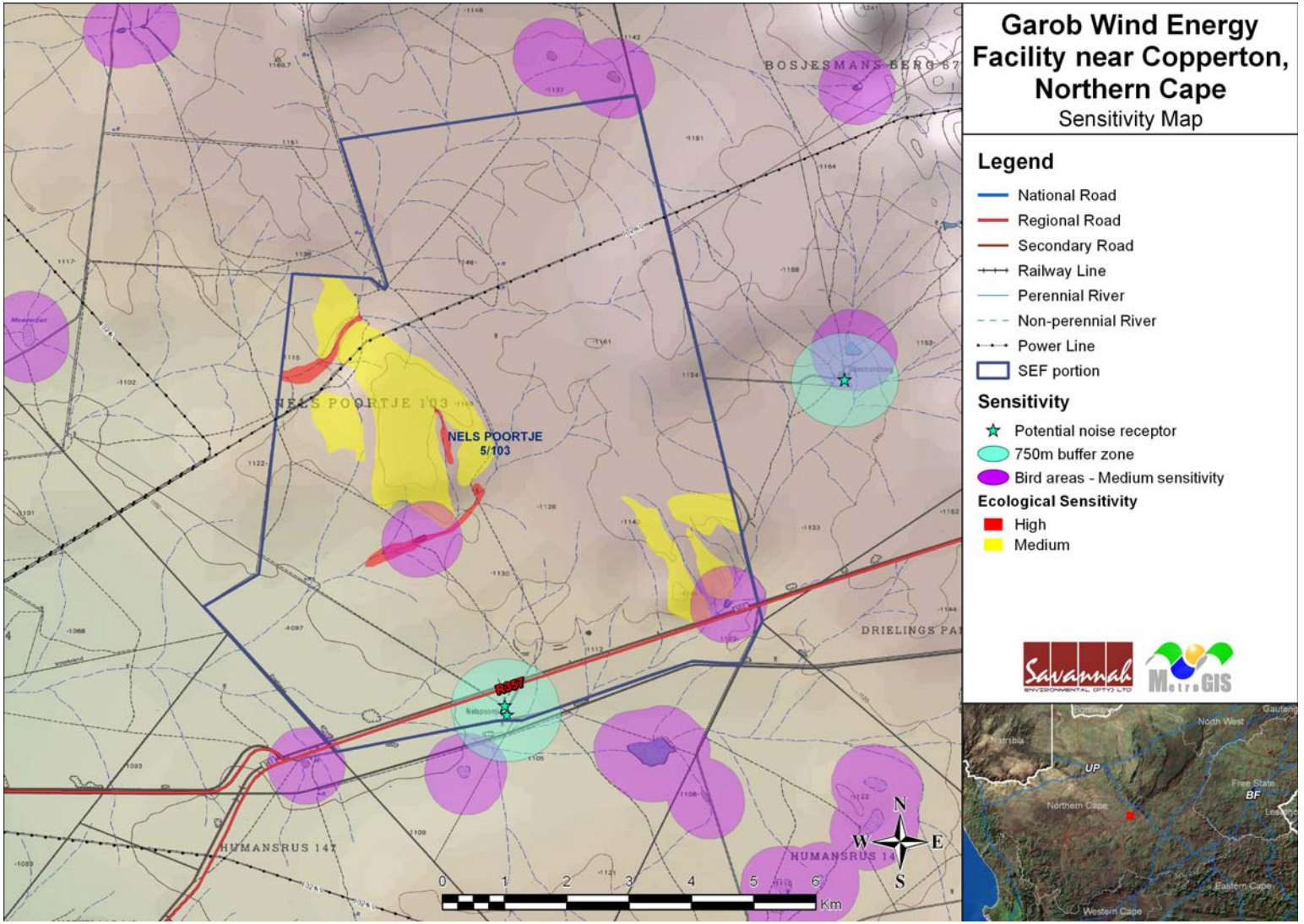

Figure 2: Desktop environmental sensitivity map for the proposed Garob Wind Farm showing areas/environmental features of potentially high and medium sensitivity (as provided by specialists at scoping).

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APPENDICES

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Betz Limit: It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical maximum amount of energy in the wind that can be collected by a wind turbine's rotor is approximately 59%. This value is known as the Betz Limit

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Cut-in speed: The minimum wind speed at which the wind turbine will generate usable power.

Cut-out speed: The wind speed at which shut down occurs.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management plan: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Generator: The generator is what converts the turning motion of a wind turbine's blades into electricity

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and Affected Party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Nacelle: The nacelle contains the generator, control equipment, gearbox and anemometer for monitoring the wind speed and direction.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Regional Methodology: The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) have developed a guideline document entitled *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006). The methodology proposed within this guideline document is intended to be a regional level planning tool to guide planners and decision-makers with regards to appropriate areas for wind energy development (on the basis of planning, environmental, infrastructural and landscape parameters).

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm).

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Tower: The tower, which supports the rotor, is constructed from tubular steel. It is approximately 80 m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. Larger wind turbines are usually mounted on towers ranging from 40 to 80 m tall. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Wind power: A measure of the energy available in the wind.

Wind rose: The term given to the diagrammatic representation of joint wind speed and direction distribution at a particular location. The length of time that the wind comes from a particular sector is shown by the length of the spoke, and the speed is shown by the thickness of the spoke.

Wind speed: The rate at which air flows past a point above the earth's surface.

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CDM	Clean Development Mechanism
CSIR	Council for Scientific and Industrial Research
CO_2	Carbon dioxide
D	Diameter of the rotor blades
DAFF	Department of Forestry and Fishery
DENC	Northern Cape Department of Environmental Affairs and Nature Conservation
DEA	National Department of Environmental Affairs
DME	Department of Minerals and Energy
DOT	Department of Transport
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GWh	Giga Watt Hour
Ha	Hectare
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEP	Integrated Energy Planning
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
LUPO	Rezoning and Subdivision in terms of Land Use Planning Ordinance, Ordinance 15 of 1985
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NGOs	Non-Governmental Organisations
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
SAAO	South African Astronomical Observatory
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited

INTRODUCTION CHAPTER 1

Garob Wind Farm (Pty) Limited is proposing the establishment of a wind energy facility and associated infrastructure on an identified site located near Copperton in the Northern Cape Province of South Africa. The proposed site is located within the Siyathemba Local Municipality (within the Pixley ka Seme District Municipality), approximately 10 km east of the town of Copperton, and ~35 km south west of the town of Prieska. This proposed project will be referred to as the **Garob Wind Farm**. This development is proposed to comprise a cluster of up to 55 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed within an area of approximately ~5520 ha in extent. The developer for the wind energy facility for Garob Wind Farm is **juwi Renewable Energies (Pty) Ltd.**

The nature and extent of the proposed facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of a facility of this nature is explored in more detail in this Draft Scoping Report. The Scoping Report consists of eleven sections:

» **Chapter 1** provides background to the proposed wind farm project and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** describes wind energy as a power option and provides insight to technologies for wind turbines
» **Chapter 4** provides a description of the processes followed in the determination of acceptable sites for the development of the proposed Garob Wind Farm Project
» **Chapter 5** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
» **Chapter 6** describes the existing biophysical and socio-economic environment
» **Chapter 7** describes the activities associated with the project (project scope)
» **Chapter 8** presents the evaluation of environmental impacts
» **Chapter 9** presents the conclusions of the scoping evaluation
» **Chapter 10** describes the Plan of Study for EIA
» **Chapter 11** provides a list of references and information sources used in undertaking this Scoping Study.

1.1. Project Overview

The proposed site was identified by juwi Renewable Energies (Pty) Ltd through a Regional Assessment in the Northern Cape. The regional site identification process included the consideration of sites/areas of special environmental importance and planning criteria, as well as issues relating to landscape character, value, sensitivity and capacity. These aspects were then balanced with technical constraining factors affecting the siting of a wind farm, including the wind resource, land availability, accessibility and existing grid infrastructure.

The proposed site which falls within the Siyathemba Local Municipality in the Northern Cape was confirmed by Garob Wind Farm (Pty) Limited as being potentially suitable for wind energy development. This area was put forward for consideration within an EIA. This area (~5520ha in extent) is proposed to be located on portion 5 of the Farm 103, (Nelspoortje farm) (refer to Figure 1.1).

The overarching objective for the wind farm planning process is to maximise electricity production through **exposure to the wind resource**, while minimising infrastructure, operational and maintenance costs, as well as **social and environmental impacts**. As **local level environmental and planning issues** were not assessed in sufficient detail through the regional level site identification process, these issues must now be considered within **site-specific studies** and assessments through the EIA process in order to delineate areas of sensitivity within the broader site and ultimately inform the placement of the wind turbines and associated infrastructure on a site.

The facility will install up to 55 turbines with a generating capacity of up to 3MW each, with a hub height of up to 120m and a rotor diameter of up to 120m. The entire facility would have a capacity of up to 140 MW. Infrastructure associated with the wind energy facility is proposed to include:

» Wind turbines of between 2 – 3.5 MW in capacity
» Concrete foundations to support the turbines
» Cabling between the turbines, to be laid underground where practical, which will connect to an on-site substation
» An on-site substation to facilitate the connection between the wind energy facility and the electricity grid
» A new overhead power line. Two power line options are proposed; Option 1 would be to connect to the existing Burchell Caprum 132 kV power line that crosses the site while Option 2 will be to connect to the existing Eskom Caprum substation approximately 8 km from the site.

» Internal access roads to each turbine (approximately 6 m in width) linking the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible
» Workshop area / office for control, maintenance and storage

Specialist software is available to assist developers in selecting the optimum position for each turbine before the project is constructed. This layout will then inform the positioning of other infrastructure such as access roads and substation/s. The preliminary positioning or detailed layout of the components of this wind plant will be developed at the EIA phase of the project. Final placement will be informed by the outcomes of the EIA as well as from the results of the on-site wind monitoring.

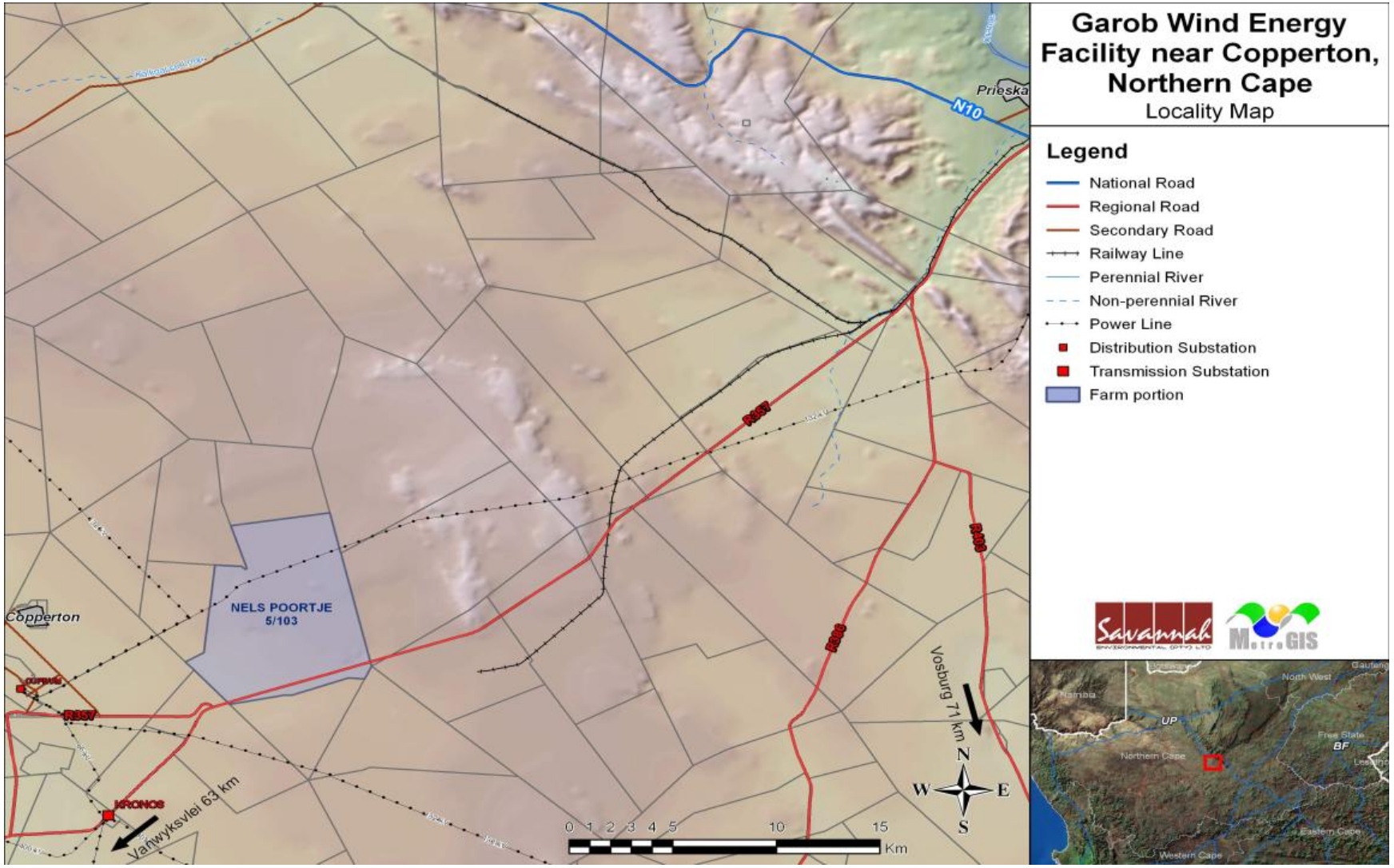


Figure 1.1: Locality map showing the study area for the establishment of the Garob Wind Farm located on Nelspoortje Farm, portio 5 of the Farm 103, located in the Siyathemba Local Municipality (Northern Cape)

1.2. The Need for the Proposed Project

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources and the rising cost of fossil fuels. In order to meet the long-term goal of a sustainable renewable energy industry and to diversify the energy-generation mix in South Africa, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Garob Wind Farm (Pty) Limited proposes the establishment of the Garob Wind Farm to add new capacity to the national electricity grid.

The proposed Garob Wind Farm was identified by juwi Renewable Energies (Pty) Ltd as a highly desirable site based on a pre-feasibility assessment that was conducted for a larger area within the Northern Cape. The proposed Garob Wind Farm site displays characteristics which makes it a preferred site for a Wind Energy Facility. The proposed farm portion covers an area approximately 5520 ha in extent, with the majority of the site located on plains and the Burchell-Cuprum 132kV distribution power line traverses the northern portion of the site.

Local level issues are now being considered within **site-specific studies** and assessment through the EIA process in order to delineate areas of sensitivity within the broader area. Once environmentally constraining factors have been determined through the EIA process, and site-specific wind data is available from wind monitoring on site, the layout of the wind turbines and associated infrastructure can be appropriately planned. Specialist software is available to assist developers in selecting the optimum position for each turbine before the project is constructed. This layout will then inform the positioning of other infrastructure such as the internal substation and access roads, and other ancillary infrastructure.

The scope of the proposed Garob Wind Farm project, (for the construction, operation and decommissioning phases) is discussed in more detail in Chapter 7.

1.3. Requirement for an Environmental Impact Assessment Process

The proposed wind energy facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority and the Northern Cape Department of Environment and Nature Conservation (DENC) will act as the commenting authority. An application for authorisation has been accepted by DEA under application reference number 14/12/16/3/3/2/279.

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. juwi Renewable Energies (Pty) Ltd appointed Savannah Environmental (Pty) Ltd as the independent **Environmental Consultants** to conduct the EIA process for the proposed project.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issues reported on in the Scoping and EIA Reports as well as dialogue with **Interested and Affected Parties** (I&APs).

In terms of sections 24 and 24D of NEMA, as read with Government Notices R543 and R546, a Scoping and EIA process is required for the proposed project (GG No 33306 of 18 June 2010).

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
Government Notice R544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275kV;or (ii) inside urban areas or industrial complexes with a capacity of 275kV or more.	A new 132 kV overhead power line
Government Notice R544, 18 June 2010	11	The construction of: (i) canals; (ii)channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk stormwater outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size (ix) slipways exceeding 50 square metres in size (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	Applicability to be confirmed at EIA stage.
GN 544, 18 June 2010	13	The construction of facilities or infrastructure for the storage, or for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.	The on-site storage of diesel and fuel in containers for construction machinery and vehicles. Applicability to be confirmed at EIA stage.
Government Notice R544, 18 June 2010	22	The construction of a road, outside urban areas, With a reserve wider than 13,5 metres, or	External and internal access roads between turbines need to be constructed.

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
		Where no road reserve exists where the road is wider than 8 metres	Temporary roads during construction could be up to 10 m in width.
GN544	26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	The site may / may not have sensitive / conservation worthy vegetation, protected under the NEM:BA, this is to be confirmed during the EIA .
Government Notice R545, 18 June 2010	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	Establishment of a wind farm with a capacity of up to 140 MW.
Government Notice R545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for (i) Linear development activities or (ii) Agriculture or afforestation where activity 16 in this schedule will apply.	The facility is proposed to be established within an area of ~5520 ha in extent.

This report documents the scoping evaluation of the potential environmental impacts of the proposed construction and operation of the proposed Garob Wind Farm project. This scoping study forms part of the EIA process and was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

1.4. Objectives of the Scoping Phase

The Scoping Phase of the EIA process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This is achieved through an evaluation of the proposed project, involving the project proponent, specialists with experience in EIAs for similar projects, and a public consultation process with key stakeholders that includes both government authorities and interested and affected parties (I&APs).

In accordance with the EIA Regulations, the main purpose of the Scoping Phase is to focus the environmental assessment in order to ensure that only potentially significant issues, and reasonable and feasible alternatives are examined in the EIA Phase. The Draft Scoping Report provides stakeholders with an opportunity to verify that the issues they have raised through the public consultation process to date have been captured and adequately considered, and provides a further opportunity for additional key issues for consideration to be raised. The Final Scoping Report will incorporate all issues and responses raised during the public review of the Draft Scoping Report prior to submission to DEA.

1.5. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was appointed by juwi Renewable Energies (Pty) Ltd on behalf of the Garob Wind Farm (Pty) Limited (project Developer) as an independent consultant to undertake an Environmental Impact Assessment (EIA) for the proposed project, as required by the NEMA EIA Regulations. Neither Savannah Environmental, nor any of the specialist sub-consultants on this project are subsidiaries of or affiliated to Garob Wind Farm (Pty) Limited. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment and planning to ensure compliance and evaluate the risk of development; and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in environmental impact assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation. Savannah Environmental is a specialist environmental consulting company providing holistic environmental management services, including environmental impact assessments and planning to ensure compliance and evaluate the risk of development; and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The EAPs from Savannah Environmental who are responsible for this project are:

» *Karen Jodas* - a registered Professional Natural Scientist and holds a Master of Science degree. She has 15 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.

» *Bongani Darryl Khupe* – the principle author of this report is a registered Professional Natural Scientist who holds a Bachelor of Science Honours degree and has more than 6 years experience in the environmental field. His key focus is on environmental impact assessments, environmental permitting, public participation, environmental management plans and programmes, strategic environmental advice, rehabilitation advice and monitoring, environmental compliance advice and monitoring as well as providing technical input for projects in the environmental management field. He is currently the responsible EAP for several renewable energy projects and other EIAs across the country.

» Umeshree Naicker - Holds an Honours Bachelor of Science degree in Environmental Science and has 4 years' experience in environmental management. Her key focus is on environmental impact assessments, environmental permitting, public participation, environmental management plans and programmes, environmental compliance advice and monitoring as well as providing technical input for projects in the environmental management field. She is currently the responsible EAP for several renewable energy projects and other EIAs across the country

Savannah Environmental has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation projects through their involvement in related EIA Processes. Savannah Environmental has developed a valuable understanding of impacts associated with the construction and operation of renewable energy facilities.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, Savannah Environmental has appointed the following specialist sub-consultants to conduct specialist impact assessments:

Specialist	Area of Expertise
Simon Todd of Simon Todd Consulting	Ecology
Jon Smallie of WildSkies Ecological Services	Avifauna
Claire Patterson-Abrolat and Megan Diamond of Endangered Wildlife Trust	Bats
Lourens du Plessis of MetroGIS	Visual impacts and GIS mapping
Jaco van der Walt of Heritage Contracts and Archaeological Consulting CC	Heritage
Tony Barbour Environmental Consulting and Research	Social
Louis George du Pisani and Theunis Gert Coetzee of Eduplan cc	Soils, erosion and agricultural potential
Morne de Jager of M2 Environmental Connections CC	Noise

Refer to Appendix A for the curricula vitae for Savannah Environmental and the specialist sub-consultants team.

2.1. Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and is informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as wind energy facilities is illustrated in Figure 2.1. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed wind energy facility.

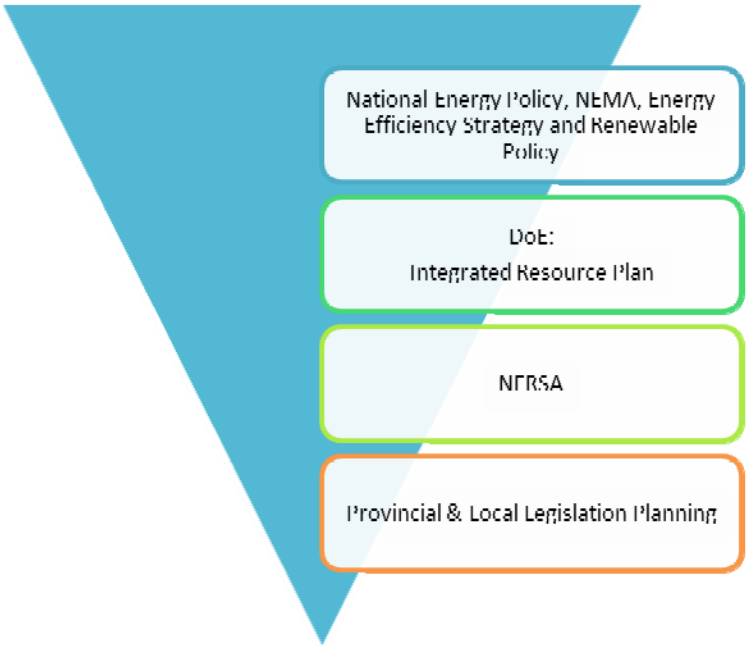


Figure 2.1: Hierarchy of electricity policy and planning documents

2.1.1. White Paper on the Energy Policy of the Republic of South Africa, 1998

Development within the energy sector in South Africa is governed by the White Paper on a National Energy Policy (the National Energy Policy), published by DME in 1998. This White Paper identifies five key objectives for energy supply within South Africa, i.e.:

» increasing access to affordable energy services;
» improving energy sector governance;
» stimulating economic development;
» managing energy-related environmental impacts; and

» securing supply through diversity.

Furthermore, the National Energy Policy identifies the need to undertake an Integrated Energy Planning (IEP) process and the adoption of a National Integrated Resource Planning (NIRP) approach. Through these processes, the most likely future electricity demand based on long-term southern African economic scenarios can be forecasted, and provide the framework for South Africa to investigate a whole range of supply and demand side options.

2.1.2. Renewable Energy Policy in South Africa

Internationally there is increasing development of the use of renewable technologies for the generation of electricity due to concerns such as climate change and exploitation of resources. In response, the South African government ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997 and acceded to the Kyoto Protocol, the enabling mechanism for the convention, in August 2002. In addition, national response strategies have been developed for both climate change and renewable energy.

Investment in renewable energy initiatives, such as the proposed wind energy facility, is supported by the National Energy Policy (DME, 1998). This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy

acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with meeting the following challenges:

» Ensuring that economically feasible technologies and applications are implemented;
» Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
» Addressing constraints on the development of the renewable industry.

In order to meet the long-term goal of a sustainable renewable energy industry, the South African Government has set the following 10-year target for renewable energy: "*10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1 667 MW) of the estimated electricity demand (41 539 MW) by 2013"* (DME, 2003).

The White Paper on Renewable Energy states "*It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet*."

2.1.3. Final Integrated Resource Plan 2010 - 2030

The current iteration of the Integrated Resource Plan (IRP) for South Africa, initiated by the Department of Energy (DoE) after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. A second round of public participation was conducted in November/December 2010, which led to several changes to the IRP model assumptions

The document outlines the proposed generation new-build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new-build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation.

The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources. The Policy-Adjusted IRP has therefore resulted in an increase in the contribution from renewables from 11,4 GW to 17,8 GW.

2.1.4 Department of Energy process for Independent Power Producers (IPP)

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources. In order to meet the long-term goal of a sustainable renewable energy industry and to diversify the energy-generation mix in South Africa, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Garob Wind Farm (Pty) Limited proposes the establishment of the Garob Wind Energy Facility to add new capacity to the national electricity grid. Garob Wind Farm (Pty) Limited will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as a power purchase agreement from Eskom (i.e. typically for a period of 20 - 25 years) in order to build and operate the proposed wind energy facility. As part of the agreement, Garob Wind Farm would be remunerated per kWh by Eskom or subsequent authority/market operator. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned, or the power purchase agreement renegotiated and extended.

The IPP will undergo a bidding process in which the Department of Energy will determine preferred bidders. A Preferred Bidder will be held to compliance with the price and economic development proposals in its bid, with regular reporting to demonstrate compliance during the life of the project.

2.2. Provincial and Local Level Developmental Policy

2.2.1. Northern Cape Growth and Development Strategy (2004-2014)

The Provincial Growth and Development Strategy (PGDS) notes that the most significant challenge that the government and its partners in growth and development are confronted with is the reduction of poverty. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The PGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The sectors where economic growth and development can be promoted include:

» Agriculture and agro-processing;
» Fishing and mariculture;
» Mining and mineral processing;
» Transport;
» Manufacturing;
» Tourism.

However, the PGDS also notes that economic development in these sectors also requires:

» Creating opportunities for lifelong learning;
» Improving the skills of the labour force to increase productivity;
» Increasing accessibility to knowledge and information.

The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are:

» Developing requisite levels of human and social capital;
» Improving the efficiency and effectiveness of governance and other development institutions;
» Enhancing infrastructure for economic growth and social development.

Of specific relevance to this project, the PGDS make reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape, the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the Province's natural resource endowments must be

encouraged. In this regard the PGDS notes "the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc, could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The PGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

The PGDS also highlights the importance of enterprise development, and notes that the current levels of private sector development and investment in the Northern Cape are low. In addition, the Province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The proposed wind energy facility therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape.

The PGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the Province's exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. It is noted that attention should be paid to ensuring that the development of large renewable energy projects, such as the proposed wind energy facility, do not negatively affect the region's natural environment or the tourism potential of the Province.

2.3.2. Siyathemba Local Municipality Integrated Development Plan (2010/ 2011)

The 2010/2011 Revision appears to be the most recent review of the Siyathemba Local Municipality IDP. Key aspects of relevance to the proposed Garob Wind Energy Facility development are discussed below.

The IDP identifies the following Key Performance Areas (KPAs) as critical to achieving Council's vision:

» Local economic development and job creation;
» Municipal financial viability and management;
» Tourism and marketing;
» Municipal health ;
» Combating HIV/Aids;
» Crime and security, including disaster management.

With regard to local economic development (LED), goals identified in the IDP include:

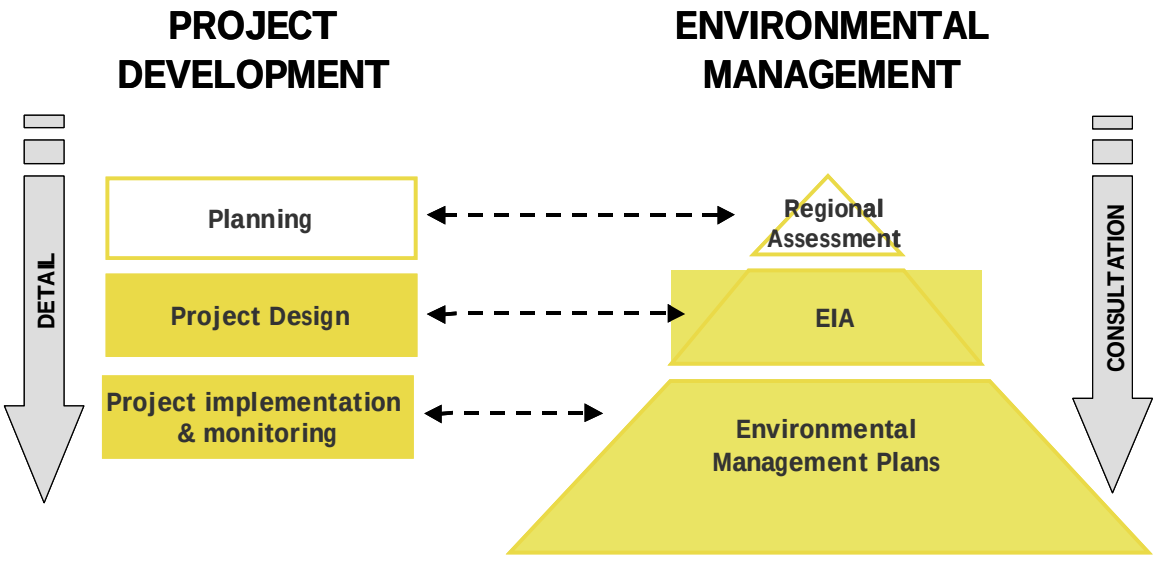
» The promotion of agriculture, tourism, mining and infrastructure development;
» The promotion of economic diversification, including Industry based on value-adding to local produce;
» Attracting and retaining capital in the Siyathemba Local Municipality.

Commercial renewable energy generation is not specifically addressed in the IDP.

2.2. Project Planning and the site-specific Environmental Impact Assessment

In terms of the EIA Regulations under NEMA, a Scoping and EIA report (including an environmental management programme (EMP)) are required to be compiled for this proposed project. The EIA is considered as an effective planning and decision-making tool in the planning process of a new power generation facility. It allows potential environmental consequences resulting from a technical facility during its establishment and its operation to be identified and appropriately managed through project design and implementation. The level of detail at a site-specific level is refined through the process, and allows for resolution of potential issue(s) through dialogue with affected parties.

The relationship between project development and the environmental assessment and management process is depicted in the figure below.



The project planning phase for the Garob Wind Energy Facility included a detailed site selection process, and the environmental suitability of the site was confirmed through a Regional Assessment process undertaken by Savannah Environmental. This site screening process is detailed further in Chapter 4 of this Scoping Report.

WIND ENERGY AS A POWER GENERATION OPTION CHAPTER 3

Compared with other renewable energy sources such as solar and bio-energy, wind turbines generate the highest energy yield while affecting the smallest land space. Wind technologies convert the energy of moving air masses at the earth's surface to mechanical power that can be directly used for mechanical needs (e.g. milling or water pumping) or converted to electric power in a generator (i.e. a wind turbine).

Use of wind for electricity generation is essentially a non-consumptive use of a natural resource, and produces an insignificant quantity of greenhouse gases in its life cycle. A wind energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of renewable technologies) as it meets all international requirements in this regard.

Environmental pollution and the emission of CO_2 from the combustion of fossil fuels constitute a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of greenhouse gas emissions worldwide. The climate change challenge needs to include a shift in the way that energy is generated and consumed. Worldwide, many solutions and approaches are being developed to reduce emissions. However, it is important to acknowledge that the more cost-effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project cost, but also indirect project cost such as impacts on the environment. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially and economically sustainable future. The challenge now is ensuring wind energy projects are able to meet all economic, social and environmental sustainability criteria.

3.1 The Importance of the Wind Resource for Energy Generation

The importance of using the wind resource for energy generation has the attractive attribute that the fuel is free. The economics of a wind energy project crucially depend on the wind resource at the site. Detailed and reliable information about the speed, strength, direction, and frequency of the wind resource is vital when considering the installation of a wind energy facility, as the wind resource is a critical factor to the success of the installation.

» **Wind speed** is the rate at which air flows past a point above the earth's surface. Average annual wind speed is a critical siting criterion, since this determines the cost of generating electricity. The doubling of wind speed increases the wind power by a factor of 8, so even small changes in wind speed

can produce large changes in the economic performance of a wind farm. Wind turbines can start generating at wind speeds of between ~3 m/s to 4 m/s, with wind speeds greater than 6 m/s currently required for a wind energy facility to be economically viable. Wind speed can be highly variable and is also affected by a number of factors, including surface roughness of the terrain. The effect of height variation/relief in the terrain is seen as a speeding-up/slowing-down of the wind due to the topography. Elevation in the topography influences the flow of air, and results in turbulence within the air stream, and this has to be considered in the placement of turbines.

» **Wind power** is a measure of the energy available in the wind.

» **Wind direction** is reported by the direction from which it originates. Wind direction at a site is important to understand, but it is not typically critical in site selection as wind turbine blades automatically turn to face into the predominant wind direction at any point in time.

A wind resource measurement and analysis programme must be conducted for the site proposed for development, as only measured data will provide a robust prediction of the facility's expected energy production over its lifetime.

The placement of the individual turbines within a wind energy facility must consider the following technical factors:

» Predominant wind direction, wind strength and frequency
» Topographical features or relief affecting the flow of the wind (e.g. causing shading effects and turbulence of air flow)
» Effect of adjacent turbines on wind flow and speed – specific spacing is required between turbines in order to reduce the effects of wake turbulence.

Wind turbines typically need to be spaced approximately 3 to 5 times the rotor diameter apart in order to minimise the induced wake effect the turbines might have on each other. Once a viable footprint for the establishment of the wind energy facility has been determined (through the consideration of both technical and environmental criteria) the spacing requirements will be considered through the process of micro-siting the turbines on the site.

3.2 What is a Wind Turbine and How Does It Work

The kinetic energy of wind is used to turn a wind turbine to generate electricity. A wind turbine typically consists of **three rotor blades** and a **nacelle** mounted at the top of a tapered **tower**. The mechanical power generated by the rotation of

the blades is transmitted to the generator within the nacelle via a gearbox and drive train.

Turbines are able to operate at varying speeds. The amount of energy a turbine can harness depends on both the wind velocity and the length of the rotor blades. It is anticipated that the turbines utilised for the proposed Garob Wind Farm in the Northern Cape will have a hub height of up to 120 m, and rotor diameter of 120 m. These turbines would be capable of generating in the order of up to 3 MW each (in optimal wind conditions).

3.2.1. Main Components of a Wind Turbine

The turbine consists of the following major components:

» The foundation
» The tower
» The rotor
» The nacelle

The foundation
The foundation is used to secure each wind turbine to the ground. These structures are commonly made of concrete and are designed for vertical loads (weight) and lateral loads (wind).

The tower
The tower, which supports the rotor, is constructed from tubular steel or concrete. It is typically up to 120m tall. The nacelle and the rotor are attached to the top of the tower.

The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

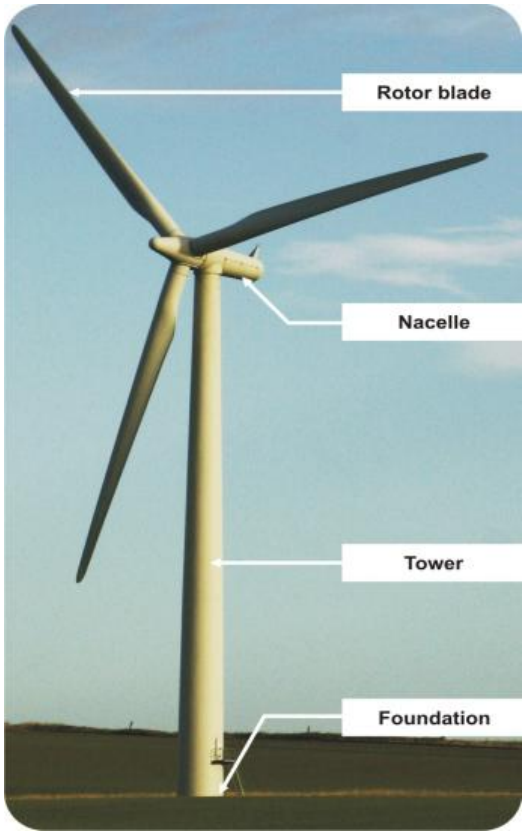


Figure 3.1: Illustration of the main components of a wind turbine

The rotor

The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades, typically made from fibreglass materials or carbon fibre reinforced plastics. When a rotor blade is in contact with wind, the airflow is deflected, airflow over the top arched edge has to take a longer path than at the relatively straight underside. This results in a low pressure at the upper side and a high pressure at the lower side. The pressure differential causes causes the blades to start moving. The speed of rotation of the blades is controlled by the nacelle, which can turn the blades to face into the wind ('yaw control'), and change the angle of the blades ('pitch control') to make the most use of the available wind.

The nacelle (geared)

The nacelle at the top of the tower accommodates the gears, the generator, anemometer for monitoring the wind speed and direction, cooling and electronic control devices, and yaw mechanism. Geared nacelles generally have a longer form than a gearless turbine.

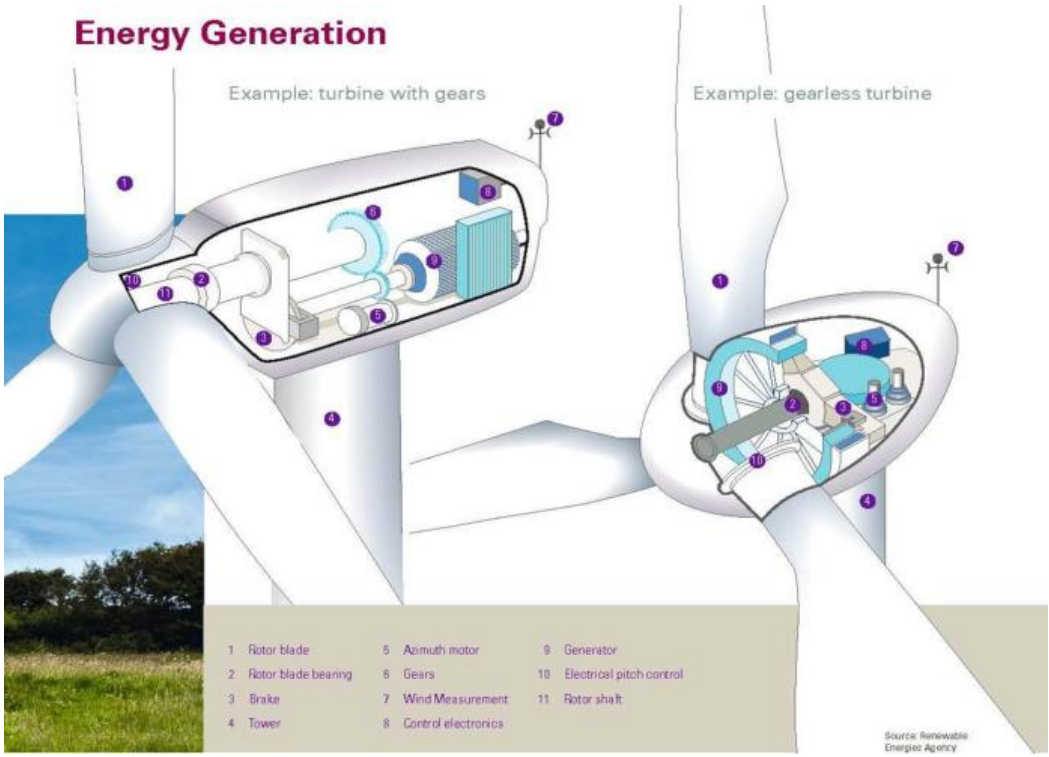


Figure 3.2: Illustration of the main components of a turbine with gears and without gears

3.2.2. Operating Characteristics of a Wind Turbine

A turbine is designed to operate continuously, unattended and with low maintenance for more than 20 years or >120 000 hours of operation. Once operating, a wind farm can be monitored and controlled remotely, with a mobile team for maintenance, when required.

The **cut-in speed** is the minimum wind speed at which the wind turbine will generate usable power. This wind speed is typically between 3 m/s and 4 m/s.

At very high wind speeds, typically over 25 m/s, the wind turbine will cease power generation and shut down. The wind speed at which shut down occurs is called the **cut-out speed**. Having a cut-out speed is a safety feature which protects the wind turbine from damage. Normal wind turbine operation usually resumes when the wind drops back to a safe level.

SUITABILITY OF THE GAROB SITE FOR THE DEVELOPMENT OF A WIND ENERGY FACILITY IN THE NORTHERN CAPE CHAPTER 4

Savannah Environmental, together with MetroGIS, undertook a regional site assessment on behalf of juwi Renewable Energies to determine acceptable areas considered suitable for wind energy development within the Northern Cape Province. The study area consisted of an area of approximately 36 0000 km^2 (225km x 160km). ***Garob Wind Farm*** (on Portion 5 of Nelspoortje farm (Farm 103) with an area extent of ~5520km^2) located near to Copperton in the Northern Cape was considered as a possible site for development of a wind energy facility. A summary of the methodology and process applied in the evaluation of juwi's identified sites and the findings of the study are given in the sections below.

4.1. Identification of the Northern Cape Area for further Investigation

The potential to establish new wind energy facility developments on five sites near De Aar and Copperton in the Northern Cape Province was identified by juwi Renewable Energies (Pty) Ltd. The sites identified as having potential for wind energy facility development included the ***Garob Wind Project***, located near to Copperton.

The five sites were identified as having potential for the installation of wind turbine generators on the basis of various technical criteria, including the wind resource, accessibility of the site, accessibility to the Eskom grid, and local site topography. As part of a pre-feasibility assessment which included site selection, a high level Regional Site Assessment was undertaken for a larger study area in the Northern Cape covering an area of approximately 36 0000 km^2 (225km x 160km) in order to inform the developer of the environmental suitability of the identified sites for the development of a wind energy facility.

This study was undertaken in accordance with the guidelines outlined in the *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006), as well as the Strategic Assessment mapping for the entire Western Cape Province (which is currently being finalised by DEA&DP). The purpose of this Regional Site Assessment was to determine areas considered suitable for development *from an environmental perspective* within the broader study area, and then to test the suitability of the five identified sites against these results. The Regional Site Assessment approach therefore served as a site risk assessment tool from an environmental acceptability perspective – that is, a process to highlight or red-flag potential issues of concern prior to initiating a full EIA process for a proposed site.

This chapter provides the outcomes of the regional assessment and technical considerations specific to the Garob Wind Project, and provides results which indicate the suitability of specific area/s for wind energy siting and development.

4.2. Criteria for testing the environmental suitability of the site

The methodology utilised is a regional level planning tool to guide project development planners (and ultimately decision-makers) with regards to the appropriate areas for development and/or the environmental suitability of identified development sites. Local level issues are not assessed in sufficient detail at this regional level, and the intention is that identified suitable or preferred areas/sites be further considered within site-specific studies and assessments (that is, through an Environmental Impact Assessment).

The objectives for the Regional Site Assessment study were therefore to:

1. Provide support to a robust, technically sound and defendable site selection process.
2. Confirm the areas of suitability within the larger study area for wind energy development from an environmental perspective.
3. Confirm the appropriateness of the sites identified for the establishment of a wind energy facility/ies (ensuring that technical and environmental constraints are minimised as far as possible).
4. Define and understand any constraints associated with the identified sites for development (in terms of the outcome of the Regional Assessment study).
5. Provide support to an application for authorisation to DEA for the preferred site/s, using the findings as a motivation for the site/s for which application is made.

The regional site assessment involved testing the site against the environmental and planning criteria as listed in the wind regional environmental assessment of the Western Cape Province to determine the potential environmental suitability of the site, as well as highlight any red flags.

The mapping exercise tested the demarcated site against the criteria as listed in the wind regional environmental assessment for the Western Cape Province.

The aim of the DEA&DP study was to undertake both a Criteria Based analysis[1] and a Landscape Based analysis[2] and to merge the results of the two studies in order to

[1] The Criteria Based assessment forms the foundation of the Regional Methodology (Elements of Method 1 from DEA&DP guideline document).

identify Preferred, Negotiable and Restricted Zones for wind energy development. Detailed planning, including the use of criteria and thresholds to designate areas of suitability for development is supported by the Department of Environmental Affairs, specifically with regards to the siting of wind energy facilities.

The input categories for the Criteria Based Method included, but were not limited to:

» Environmental criteria that would be negatively affected by the construction and operation of a wind energy facility (e.g. national parks, nature reserves, rivers, wetlands, etc.)
» Topographical information
» Urban and industrial planning criteria
» Infrastructure criteria that would negatively affect the placement of a wind energy facility (e.g. airports, military installations, etc.)
» Vertically disturbed landscape corridors (major transmission lines, railway lines, etc.)

The input categories for the Landscape Based Method included aspects such as:

» Major scenic drives, routes of tourism importance
» Local scenic drives or "cultural" routes
» Defined historical or heritage sites
» Scenic areas, areas of natural beauty
» Viewshed analysis/visual exposure
» Landform/land cover analysis

The combined results of the two methods were merged to highlight the site's environmental suitability for a wind energy development.

4.3. Data Sources for the Regional Assessment

Data sources utilised in the mapping assessment are outlined in Table 4.1. This data was compiled in accordance with the data layers utilised in the Western Cape Provincial Government document: *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape*.

[2] Landscape Assessment as a vital component, incorporating character analysis, sensitivity, value and capacity considerations (Elements of Method 2 from DEA&DP guideline document).

Table 4.1: Data utilised in the GIS mapping assessment

Name	Note	Source	Scale	Buffer
Layer 1				
Protected areas	Statutory (Provincial and national) Private Natural Heritage Sites	SANBI	1:50 000	Statutory (1km) Private/NHS (500m)
Wetlands/water bodies	Dams, pans, lakes, estuaries (all water bodies)	Surveyor general	1:50 000	500m
Ramsar sites		Western Cape Nature Conservation Board	1:50 000	2km
Rivers	Perennial and non-perennial	DWAF	1:250 000	Perennial (2km) Non-perennial (500m)
National Parks and Viewshed Protection Zones	The National Park boundaries are additional to the SANBI protected areas boundaries	SANParks	1:50 000	Viewshed Protection Zones is the buffer
Mountain Catchments	MCA_boundaries	Western Cape Nature Conservation Board	1:50 000	500m
National Protected Areas Expansion Strategy	NPAES boundaries	SANBI	Unknown	No buffer
Priority Natural Areas in the vicinity of National Parks		SANParks	Unknown	No buffer
Conservancies		Western Cape Nature Conservation Board	1:50 000	500m
World Heritage Sites		DEA	1:50 000	2km
Threatened eco-systems	Vegmap 2006 (endangered and critically endangered vegetation types)	SANBI	1:50 000	No buffer
Layer 2				
Mountains, ridges and hills	Combined dataset utilising the National Landtypes data and a DTM generated from the 20m interval contours	MetroGIS	1:50 000	
Layer 3				
Residential and mining/industrial	National Land Cover 2009	CSIR/ARC	1:50 000	Residential (1km negative buffer)

Name	Note	Source	Scale	Buffer
areas				Industrial (5km positive buffer)
Layer 4				
Agricultural land – irrigated agriculture	National Land Cover 2009	CSIR/ARC	1:50 000	No buffer
Layer 5				
Local/major airports		Surveyor General CAA SAAF	1:50 000	Local (2km) Major (35km)
Telecommunication towers		CAA	1:50 000	500m
Layer 6				
Transmission and Major Distribution Power lines		Eskom	1:50 000	Tx (5km) Dx (2km)
Railway lines		Surveyor General	1:50 000	2km
Layer 7				
Roads	Major roads (national, arterial, main) and official tourist routes (incl. secondary and other access roads)	Surveyor General	1:50 000	Major road (1km) Scenic/tourist road (1km)
Layer 8 (a, b and c)				
Landscape based assessment	Derived from analyses and overlays for: Landcover/vegetation transformation Zones of visual influence Landscapes/land forms	MetroGIS	1:50 000	
Composite				
Preferred areas for development	Composite of all criteria	MetroGIS	1:50 000	

4.4. Results of the Regional Site Assessment

The input components resulted in various layers of information that were merged using GIS to form a combined dataset (various combinations of positive and negative criteria) which have defined **preferred areas/zones for development** based on environmental and planning criteria. The table below indicates the possible combinations (based on the DEA&DP study) that resulted in the preferred areas for development index that is displayed in the map legend.

No.	Description	Preference
1	Areas with more than 1 negative criteria	Highly restricted/constrained
2	Areas with one negative criteria	Restricted/constrained
3	Neutral areas (no positive or negative criteria)	Negotiable
4	Areas with one positive criteria (and no negative criteria)	Preferred
5	Areas with more than one positive criteria (and no negative criteria)	Highly preferred

The rating system utilised within the updated DEA&DP SEA takes a more 'risk adverse approach' than that put forward by the initial DEA&DP guideline. The rating system assumes that a criteria rated as negative would always override a criteria rated as positive. Definitions of the terms used to define the level of preference are as follows:

» ***Highly Preferred / Preferred:*** Low landscape value with a high to low capacity for change. Wind energy facility development may be possible, subject to site level assessment.
» ***Negotiable:*** Low to high landscape values, but with a high capacity to absorb change. Wind energy development in these areas may be possible, subject to site level assessment.
» ***Restricted / High Restricted:*** High value landscapes combined with low capacity of landscape to adapt to change. These areas should ideally be restricted from wind energy facility development.

A Composite Map was generated to show the most favourable areas for development of a wind energy facility within the study area (indicated in dark and pale green) from an environmental perspective (refer to Figure 4.1).

The results from the tests indicated that Garob Wind Farm was a site of high potential for development based on the following conclusions from the regional assessment:

* This development site falls largely within a preferred and highly preferred area, i.e. an area with one or more positive criteria, and no negative criteria.
* This site falls within a vegetation type known as Bushmanland Arid Grassland, which is classified as Least Threatened (Driver et al. 2005; Mucina et al., 2006) and not flagged as being of conservation concern. However, the site should be more carefully searched for one plant species of conservation concern and for the distribution of the protected tree species that occurs there. The condition of the vegetation can be confirmed through a botanical survey/assessment.

* Positive (inclusionary) criteria (including disturbed vertical landscapes) which overlap with this development site include the open plains, as well as the Burchell-Cuprum 132kV power line which traverses the site.
* Only the portion along the southern boundary of the site (where the site is traversed by the R357) is considered to be constrained to development.

4.5. Identification of a Site for Investigation in the EIA Process

Following the regional site assessment, it was juwi Renewable Energies' intention to proceed with an EIA process for the proposed Garob Wind Energy Facility under the project development company **Garob Wind Farm (Pty) Limited**. As this Regional Site Assessment has guided juwi to site/locate their proposed facility within an area/zone of preference (as per the regional methodology followed), no alternative locations/sites will be required to be considered through the EIA process.

The demarcated area is an indicative area (~5520ha in extent) considered to be favourable/most viable for the development of a large-scale wind energy facility. This area is on the Farm 103, portion 5 (Nelspoortje farm).

The demarcated area is considerably larger than that area required for the facility (as only ~5% of the proposed site will be disturbed by the proposed wind energy facility), which allows for a degree of flexibility in turbine placement to accommodate both technical factors (wind resource and/or lie of the land) and environmental factors (sensitive environmental receptors). The entire farm portion has, however, been considered within this Draft Scoping Report.

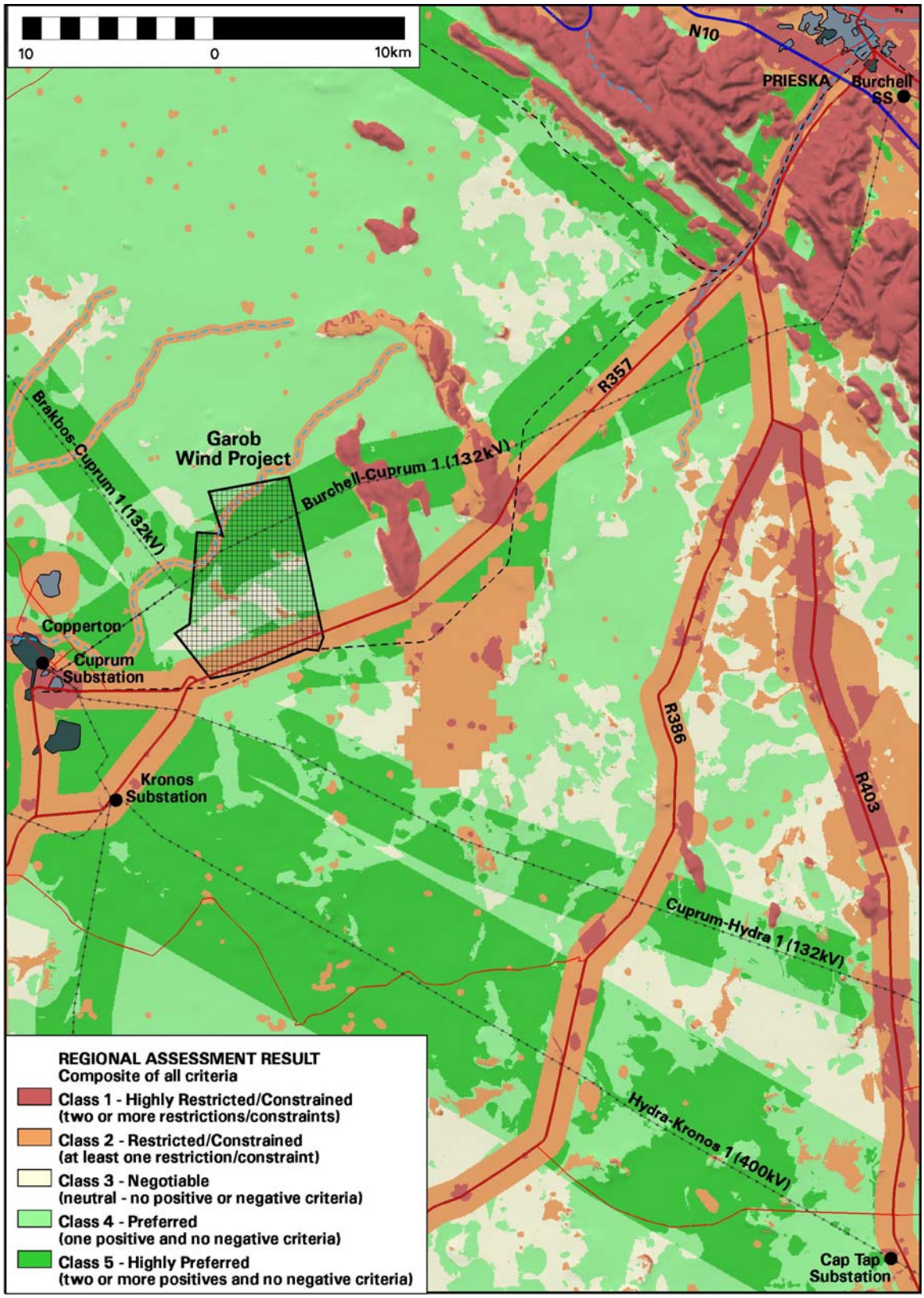


Figure 4.1: Composite map of all criteria of the Regional Assessment indicating the location of the proposed development site (indicated as Garob Wind Project)

APPROACH TO UNDERTAKING THE SCOPING PHASE CHAPTER 5

An Environmental Impact Assessment (EIA) refers to the process involving the identification and assessment of direct, indirect and cumulative environmental impacts associated with a proposed project. The EIA process comprises two Phases: a **Scoping Phase** and an **EIA Phase**. The Scoping Phase culminates in the submission of a Scoping Report to the Department of Environmental Affairs as the competent authority for review and acceptance before proceeding onto the EIA Phase of the process. The EIA Phase culminates in the submission of an Environmental Impact Report (EIR), including an Environmental Management Programme (EMP), to the competent authority for review and decision-making.

The phases of the EIA process are as follows:

Figure 5.1: The four phases of the EIA process

The Scoping Phase for the proposed Garob Wind Energy Facility Project has been undertaken in accordance with the EIA Regulations GNR543, published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No. 107 of 1998). This **Draft Scoping Report** aimed to identify and describe potential environmental impacts associated with the proposed project and to define the extent of the specialist studies required within the EIA process. This was achieved through an evaluation of the proposed project involving specialists (with expertise relevant to the nature of the project and the study area), the project proponent, as well as a consultation process with key stakeholders, relevant government authorities and **interested and affected parties (I&APs)**. This chapter outlines the process which was followed during the Scoping Phase of the EIA process and outlines the applicable legislation for the proposed project.

5.1. Objectives of the Scoping Phase

The Scoping Phase aims to:

» Describe the **baseline / affected environment** prior to development.
» **Identify potential environmental and social impacts** (both positive and negative) associated with the construction and operation phases of the proposed development, through a desktop review of existing baseline data and specialist studies.
» Make **recommendations regarding more detailed studies** required in the EIA phase of the process.
» Provide **interested and affected parties** with an opportunity to have **input** on the proposed project through consultation and review of the Draft Scoping Report.
» Provide the authorities with **sufficient information** in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required as part of the EIA Phase.

Within this context, the objectives of this Scoping Phase are to:

» Describe the **scope** and **nature** of the proposed development.
» Describe the reasonable and feasible project-specific **alternatives** to be considered through the EIA process, including the 'no-go' option.
» Identify and evaluate key **environmental issues or impacts** associated with the proposed project and, through a process of broad-based consultation with I&APs and stakeholders and desk-top specialist studies, identify those issues to be assessed in more detail in the EIA Phase of the EIA process.
» Conduct an open, participatory and transparent **public involvement process** and facilitate the inclusion of I&AP and stakeholder concerns regarding the proposed project in the decision-making process.

5.2. Regulatory and Legal Context

The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority which exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels.

As wind energy developments are multi-sectoral, encompassing economic, spatial, biophysical, and cultural dimensions, various statutory bodies are likely to be involved in the approval process for the proposed facility.

5.2.1. Regulatory Hierarchy

At the National Level, the main regulatory agencies are:

» *Department of Energy (DOE):* This Department is responsible for policy relating to all energy forms, including renewable energy, and are responsible for forming and approving the IRP (Integrated Resource Plan for Electricity). Wind energy is considered under the White Paper for Renewable Energy (2003) and the Department undertakes research in this regard. It is the controlling authority in terms of the Electricity Regulation Act (Act No 4 of 2006).
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for wind energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites
» *South African Civil Aviation Authority (SACAA):* This Department is responsible for aircraft movements and radar, which are aspects that influence wind energy development location and planning.
» *South African National Roads Agency (SANRAL):* This agency of the Department of Transport is responsible for all National road routes.
» *Department of Water Affairs (DWA):* This Department is responsible for effective and efficient water resources management to ensure sustainable economic and social development.
» *Department of Forestry and Fishery (DAFF):* This Department is the custodian of South Africa's agriculture, fisheries and forestry resources and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector. This Department has published a guideline for the development of wind farms on agricultural land.

At the Provincial Level, the main regulatory agencies are:

» *Provincial Government of the Northern Cape – Department of Environment and Nature Conservation (DENC):* This Department is the commenting authority for this project.
» *Department of Transport and Public Works (Northern Cape):* This Department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.

» *Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):* This body is responsible for all heritage related issues in the Northern Cape Province.
» *The Department of Agriculture:* This Department is responsible for all matters which affects agricultural land.
» *Department of Water Affairs:* This Department is responsible for evaluating and issuing licenses pertaining to water use.

At a local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. The Siyathema Local Municipality was identified as having jurisdiction over the area in which the proposed facility is foreseen to be established. The Siyathemba Local Municipality also forms part of the Pixley ka Seme District Municipality. Both of these municipalities will be consulted with throughout the EIA process.

There are also numerous non-statutory bodies and environmental lobby groups that play a role in various aspects of planning and the environment that will influence wind energy development.

5.2.2. Legislation and Guidelines that have informed the preparation of this Scoping Report

The following legislation and guidelines have informed the scope and content of this Draft Scoping Report:

» National Environmental Management Act (Act No. 107 of 1998)
» EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010)
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  * Public Participation in the EIA Process (DEA, 2010)
  * Integrated Environmental Management Information Series (published by DEA)
» Siyathemba Local Municipality Integrated Development Plan (2010/ 2011)
» International guidelines – the Equator Principles and the International Finance Corporation and World Bank Environmental, Health, and Safety Guidelines for Wind Energy (2007).

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the Scoping Phase and to be addressed in the EIA Phase. A listing of relevant legislation is provided in Table 5.1 below. A more

detailed review of legislative requirements applicable to the proposed project will be included in the EIA Phase.

Table 5.1: Initial review of relevant policies, legislation, guidelines and standards applicable to the proposed Garob Wind Farm

Legislation	Applicable Sections
National Legislation	
Constitution of the Republic of South Africa (Act No 108 of 1996)	» Bill of Rights (S2) » Environmental Rights (S24) – i.e. the right to an environment which is not harmful to health and well-being » Rights to freedom of movement and residence (S22) » Property rights (S25) » Sufficient water (s27.1.b) » Access to information (S32) » Right to just administrative action (S33) » Recognition of international agreements (S231)
National Environmental Management Act (Act No 107 of 1998)	» National environmental principles (S2), providing strategic environmental management goals and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment » NEMA EIA Regulations (GN R543 of 18 June 2010) published in terms of Chapter 5 of the NEMA » Public Participation (S2) » The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority (S24 – Environmental Authorisations) » Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise & rectify pollution or degradation of the environment » Procedures to be followed in the event of an emergency incident which may impact on the environment (S30) » Appeals against decisions made by authorities (S43)
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)

Legislation	Applicable Sections
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7) » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35) » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36) » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development (S38) » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44)
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to list ecosystems which are threatened and in need of protection (S52) – none have as yet been published » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) - none have as yet been published » A list of threatened & protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » This act also regulates alien and invader species. » Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» National, provincial and local ambient air quality standards (S9 - 10 & S11) » Listed Activities (S21) » Atmospheric Emissions Licenses (S22) » Measures in respect of dust control (S32) – no

Legislation	Applicable Sections
	regulations promulgated as yet » Measures to control noise (S34) - no regulations promulgated as yet
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) and restrictions in terms of where these species may occur » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048) » Soil protection/conservation, and erosion control
National Water Act (Act No 36 of 1998)	» National Government is the public trustee of the Nation's water resources (S3) » Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire fighting and recreational use, as set out in Schedule 1 » Duty of Care to prevent and remedy the effects of pollution to water resources (S19) » Procedures to be followed in the event of an emergency incident which may impact on a water resource (S20) » Definition of water use (S21) » Requirements for registration of water use (S26 and S34) » Definition of offences in terms of the Act (S151)
Water Services Act (Act No 108 of 1997)	» No person may dispose of industrial effluent except in a manner approved by the water services provider (S7)
Aviation Act (Act No 74 of 1962)	» 13th amendment of the Civil Aviation Regulations (CARs) 1997 » The Minister of Transport has under section 22(1) of the Aviation Act, 1962 made the regulations in the Schedule hereto. » Obstacle limitations and marking outside aerodrome or heliport - CAR Part 139.01.33
National Environmental Management Waste Act (Act No 59 of 2008)	» Waste management measures » Regulations and schedules (Schedule A & B) » Listed activities requiring waste licenses » Waste disposal practices (S20) » Contamination
National Forests Act (Act No 84 of 1998)	» Protected trees » Conservation of forests

Legislation	Applicable Sections
National Roads Act (Act No 7 of 1998)	» Policy concerning use and management of national roads.
Northern Cape Nature Conservation Act (Act No 9 of 2009)	» This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: * Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property. * Aquatic habitats may not be destroyed or damaged. * The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province.
Guideline Documents	
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments in terms of NEMA No. 107 of 1998	» Prediction of impact that noise emanating from a proposed development would have on occupants of surrounding land by determining the rating level. » Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits
The White Paper on Renewable Energy (2003)	» National targets for renewable energy generation
Siyathemba Local Municipality 2011/2012 Revision	» to provide the overarching strategic framework for the sustainable long-term management of the relevant municipality

5.3. Methodology for the Scoping Phase

The Scoping Phase has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of NEMA. Key tasks undertaken within the scoping phase are discussed in more detail below.

5.3.1. Authority Consultation and Application for Authorisation in terms of GN No R543 of 2010

As this is an energy generation project, the National Department of Environmental Affairs (DEA) is the competent authority for this application. As the project falls within the Northern Cape Province, the Department of Environment and Nature Conservation, Northern Cape (DENC) will act as the commenting authority for the application. Consultation with both these authorities has been undertaken throughout the Scoping process and has included the following:

» Submission of an application for authorisation to DEA with a copy submitted to DENC.
» This application was accepted and reference number **14/12/16/3/3/2/279** was allocated; acceptance was granted to continue with the Scoping Phase (6 March 2012).

A record of all authority consultation undertaken prior to and within the Scoping Phase is included within Appendix B.

5.3.2. Public Participation Process

The aim of the public participation process is primarily to ensure that information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs. Furthermore, participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the application. And lastly, all comments received from stakeholders and I&APs are recorded, which serve to further direct the specialist studies and the EIA process.

The schematic diagram in Figure 5.2 illustrates some of the key steps in the public participation process. These are discussed further below:

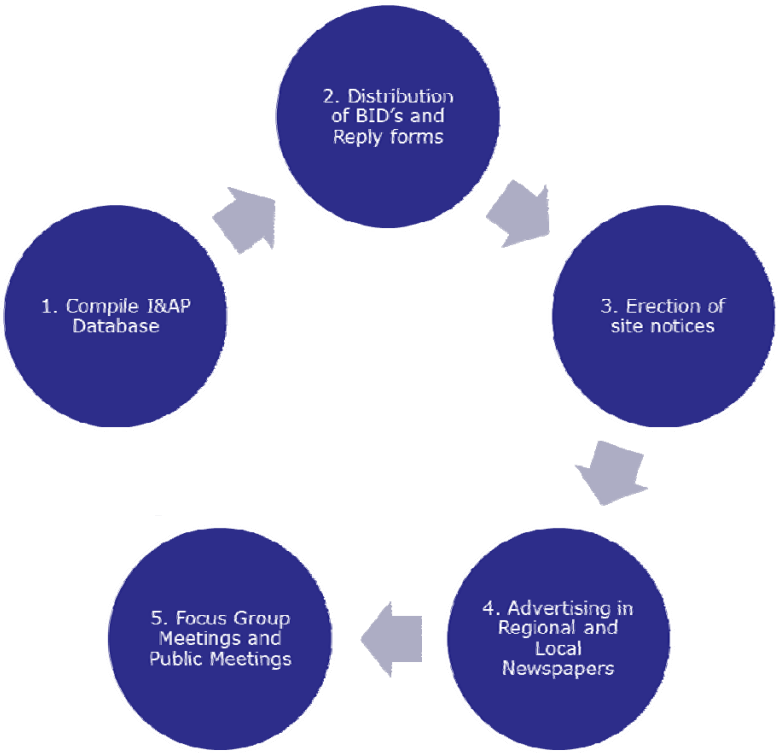


Figure 5.2 Key steps of the Public Participation Process

1. Identification of I&APs and establishment of the I&AP Database

Identification of I&APs was undertaken by Savannah Environmental through existing contacts and databases, and newspaper advertisements as well as through the process of networking. The key stakeholder groups identified include:

* Provincial and local government departments (including DEA, DENC, SAHRA, DWA, DAFF, SANRAL, etc.)
* Government structures (including the provincial roads authority, municipal planning departments, etc)
* Siyathemba Local Municipality and Pixley ka Seme District Municipality
* Potentially affected and neighbouring landowners and tenants
* Local authorities
* Conservation authorities
* CBOs and other NGOs.

The I&AP details were recorded within an I&AP database (refer to Appendix C for a listing of I&APs). The database will be updated on an on-going basis during the EIA process.

2. Distribution Background Information Document and Reply Form

In order to provide information regarding the proposed project and the EIA process, a background information document (BID) and reply form for the project was compiled (refer to Appendix E). The BID was distributed to identified stakeholders and I&APs, and additional copies were made available at public venues within the broader study area.

3. Newspaper Advertisements

In order to notify and inform the public of the proposed project and register as an I&AP, an advertisement was placed in The Gemsbok on 06 April 2012.

Networking with I&APs will continue throughout the duration of the Scoping and EIA processes.

5.3.3. Identification and Recording of Issues and Concerns

Issues and concerns raised by I&APs during the Scoping Phase will be consolidated in a **Comments and Response Report**. A Comments and Response Report incorporating all comments from the scoping phase will form part of the Final Scoping Report that will be submitted to DEA. The Comments and Response Report includes responses from members of the EIA project team and/or the project developer to either indicate how the issues will be addressed in the EIA Phase, or to provide clarification. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view will be provided.

5.3.4. Evaluation of Issues Identified through the Scoping Process

Issues (both direct and indirect environmental impacts) associated with the proposed project identified within the scoping process have been evaluated through desk-top studies. In evaluating potential impacts, Savannah Environmental has been assisted by the following specialist consultants:

Specialist	Area of Expertise
Simon Todd of Simon Todd Consulting	Ecology
Jon Smallie of WildSkies Ecological Services	Avifauna
Claire Patterson-Abrolat and Megan Diamond of Endangered Wildlife Trust	Bats
Lourens du Plessis of MetroGIS	Visual impacts
Jaco van der Walt of Heritage Contracts and Archaeological Consulting CC	Heritage
Tony Barbour Environmental Consulting and Research	Social
Louis George du Pisani and Theunis Gert Coetzee of Eduplan cc	Soils, erosion and agricultural potential

Morne de Jager of M2 Environmental Connections CC	Noise

Potential direct and indirect environmental impacts that are identified within the Scoping Phase have been evaluated through desk-top studies. In evaluating potential impacts, Savannah Environmental has been assisted by the following specialist consultants:

In order to evaluate issues and assign an order of priority, it was necessary to identify the characteristics of each potential issue/impact:

» *the nature,* which includes a description of what causes the effect, what will be affected and how it will be affected
» *the extent,* wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional

The specialist reports are attached in **Appendices F-M.**

5.3.5. Public Review of Draft Scoping Report and Feedback Meeting

This is the **current stage** of the Scoping Phase. The Draft Scoping Report has been made available for public review from **07 June 2012 to 09 July 2012** at the following locations:

» www.savannahsa.com
» Siyathemba Public Library
» Alpha Library
» Alkantpan Lodge

In order to facilitate comments on the Draft Scoping Report, a public feedback meeting will be held during the review period for the Draft Scoping Report as follows:

» Date: 21 June 2012
» Time: 17:00
» Venue: Nelspoortjie Karoo Guest Farm (48 Km out of Prieska on the Copperton/Vanwyksvlei tar road)

The public review process and details of the public meeting were advertised in the Volksblad (01 June 2012) and The Gemsbok (06 June 2012). In addition, all registered I&APs were notified of the availability of the report and public meeting by letter (refer to Appendix E).

5.3.6. Final Scoping Report

The final stage in the Scoping Phase will entail the capturing of responses from I&APs on the Draft Scoping Report in order to refine this report. It is this final report upon which the decision-making environmental authorities provide comment, recommendations and acceptance to undertake the EIA Phase of the process.

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 6

This section of the Draft Scoping Report provides a description of the environment from a desktop perspective that may be affected by the proposed Garob Wind Farm, located near Copperton (35 km north east of the proposed site) in the Northern Cape Province. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected desktop data undertaken by specialists who have a working knowledge of the area, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices F to M).

6.1 Regional Setting and the Study Area

6.1.1 Regional Setting

The proposed Garob Wind Energy Facility site is located in the sparsely populated, arid Karoo region, approximately 10 km east of the small former mining town of Copperton, within the Siyathemba Local Municipality. The main settlements in the Siyathemba Local Municipality are the towns of Prieska, Marydale, Niekerkshoop, Draghoender and Copperton.

The town of Prieska, which is the administrative seat of the Siyathemba Local Municipality, is located on the southern bank of the Gariep, approximately 35 km north east of the proposed site. Prieska is by far the largest town in the Siyathemba Local Municipality, and functions as the leader town in the municipality.

6.1.2 The study area

The broader study area[3] includes the towns of Copperton and Prieska. In addition, a number homesteads are dotted throughout the study area at a low density. A number of arterial roads traverse the broader study area. These include the R357 (which bisects the southern portion of the site) linking Prieska and Copperton, the R386 and the R403. A few secondary roads are also present in the vicinity of Prieska and Copperton respectively. A railway line also runs between Copperton and Prieska, roughly following the alignment of the R357.

[3] The broader study area encompasses a geographical area of approximately 2136km².

Industrial-type infrastructure includes old mining infrastructure in and around Copperton and some industry / mining in Prieska. In addition, a number of power lines are present, including the Burchell-Cuprum 1 (132kV) power line, which traverses the site, and four others ranging from 132kV to 400kV.

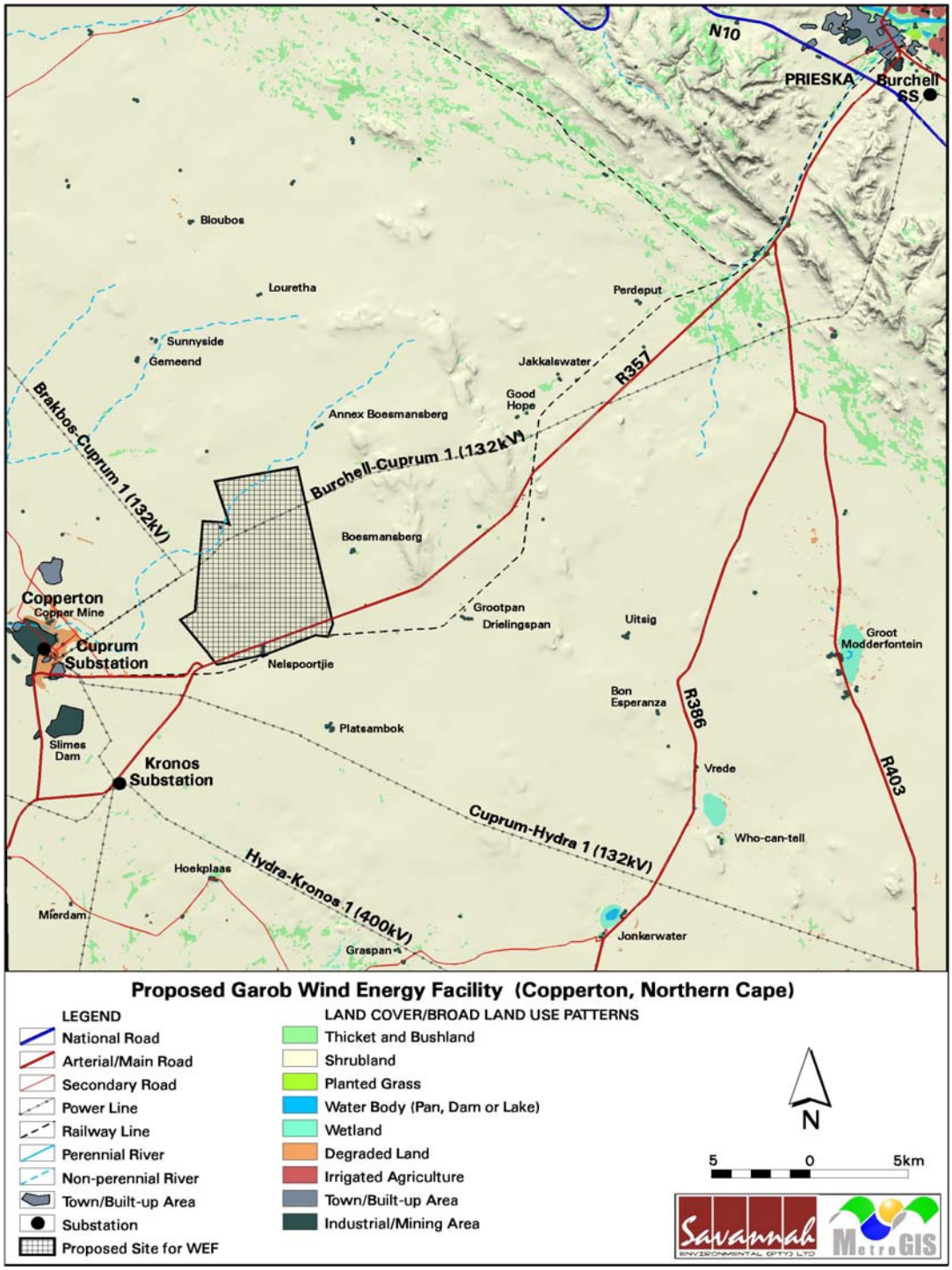


Figure 6.1: Land cover/land use map of Portion 5 of the Farm Nelspoortje No. 103, as ell as the broader study area

6.2 Climatic Conditions

The climate of the area is typical of the desert and is categorised as arid. The average annual temperate is 20 – 22, 5 (°C) degrees Celsius. The mean annual rainfall of the area where the site is located is approximately 160 mm. The rainfall is unreliable and the precipitation is mainly due to convectional showers in summer and autumn, with the height of the rainfall season occurring between the months of February and April (single, very rare, heavy showers can account for as much as the normal annual precipitation).

6.3 Biophysical Characteristics of the Study Site and Surrounds

6.3.1 Topography

The broader studyarea is characterised by terrain that ranges in elevation from about 920 m above sea level (asl) along the Orange River (located just north east of Prieska) to about 1360 m asl at the tops of the Doringberge in the north east of the study area. The site (Portion 5 of the Farm Nelspoortje No. 103) lies at an elevation of about 1100 m – 1140 m asl (refer to Figure 6.2 below).

The topography consists of *slightly irregular plains and hills*. The Doringberge lie in the far north east of the broader study area, with some smaller local hills situated in closer proximity to the site, to the north east. The terrain on and immediately surrounding the site is relatively flat.

6.3.2 Hydrology

The most significant hydrological feature within the region is the Orange River, which lies just beyond of the town of Prieska in the north east. A few non-perennial tributaries draining to the north east and south west are present in the broader study area. Some isolated pans / wetlands are located in the south east of the study site.

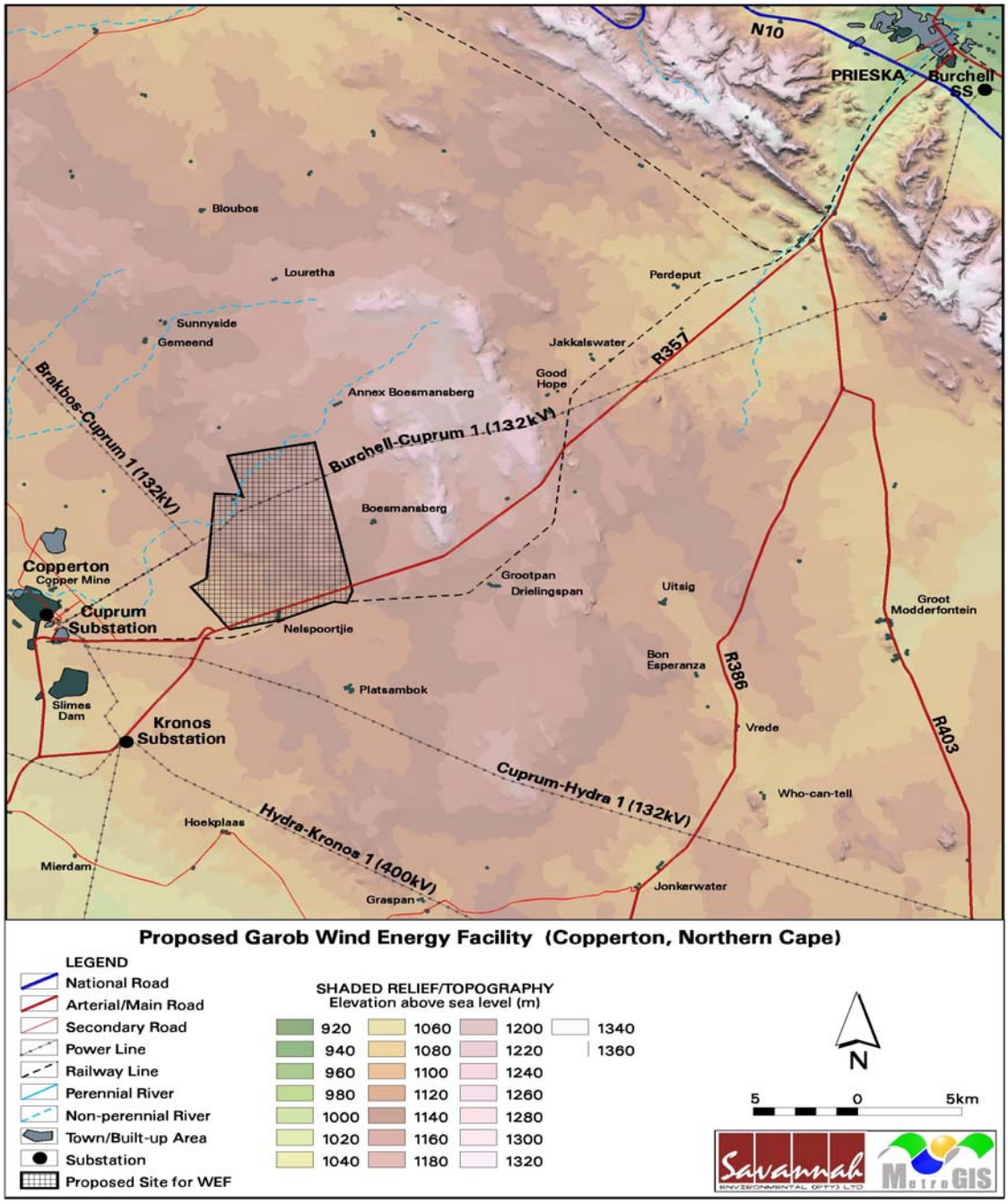


Figure 6.2: Shaded relief map indicating the location of the proposed facility and the topography and elevation above sea level

6.3.3 Soils, Land Use and Agricultural Potential

The geology of this area is dominated by Granite and Meta-Sediments of the Namaqualand Metamorfic Complex. The site is situated within the Ag Land Type.

Land Type Ag

The A group of land types has yellow and red soils without water tables and the following soil forms are prevalent, i.e. Clovelley, Griffin, Hutton, Inanda, Kranskop and Magwa. The area is dominated by moderately deep Hutton soils and shallow soils of the Glenrosa and Mispah forms. According to the classification of the AGIS Website of the Department of Agriculture, Fisheries & Forestry and Department of Agricultural Development (1991), the site falls within an area with soils with minimum development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils, and where lime is rare or absent in the landscape.

Land capability and land use:

This region is non-arable. The "best use'' for the area is for grazing with sheep, goats and beef cattle. The grazing capacity of the region varies between 26 ha/LSU[4] and 32 ha/LSU.

Agricultural potential:

The agricultural potential of the site is relatively poor in terms of agricultural potential and is limited to extensive grazing due to the very low rainfall. There is no identified agriculturally important infrastructure, i.e. (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.) located on the site.

6.3.4 Ecological Profile of the Study Area

Vegetation

The study area lies within the Bushmanland Arid Grassland vegetation type. This is an extensive vegetation type in the Northern Cape that stretches from Aggeneys in the west to Prieska. Less than 1% has been transformed and the vegetation type is classified as Least Threatened.

[4] The Livestock Unit, LU or LSU is a measure of livestock grazing in agriculture, expressed either as a total for a whole field or farm, or as units per hectare (ha) or acre.

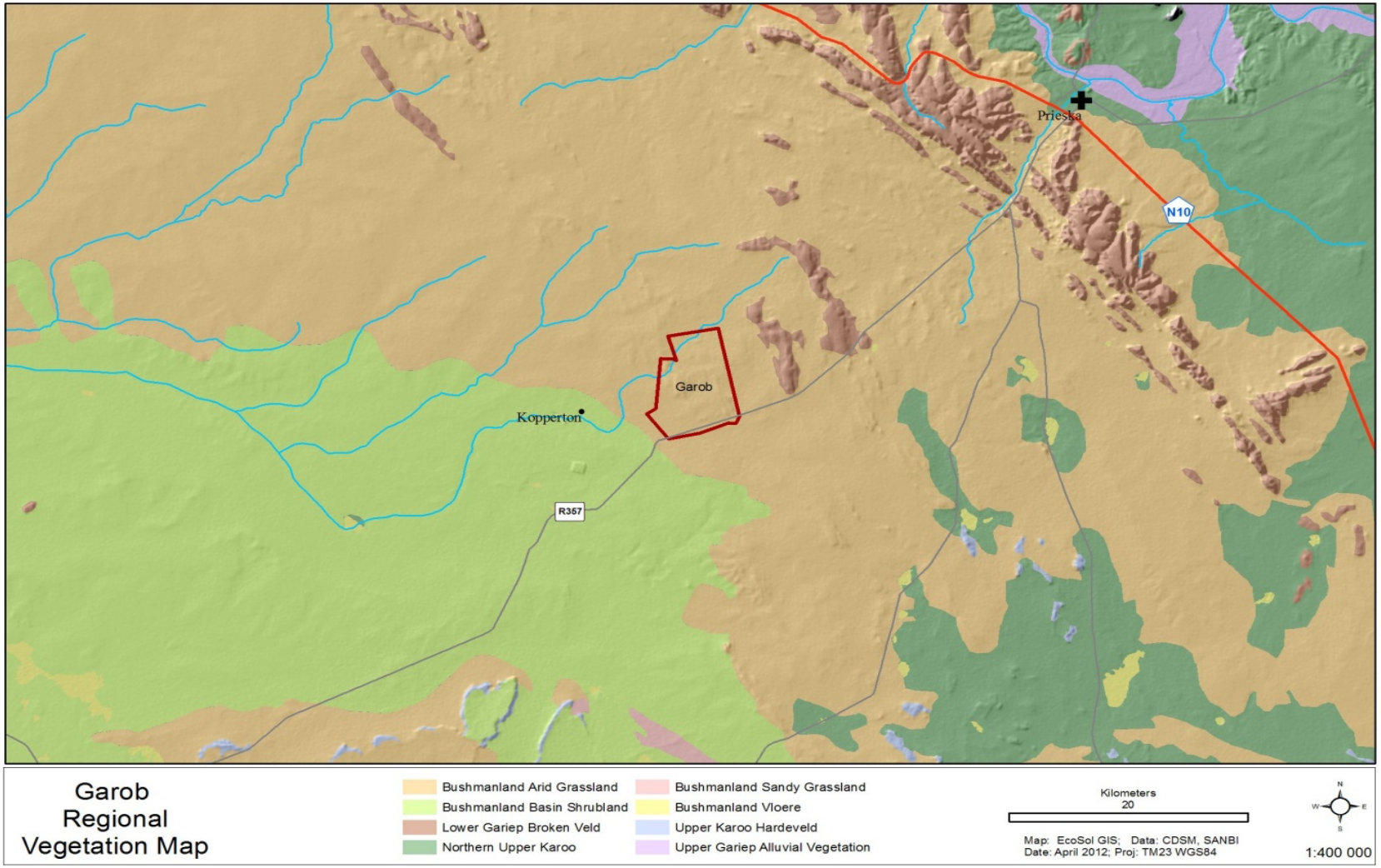


Figure 6.3: The broad-scale vegetation types surrounding the proposed Garob Wind Farm. Although the entire site falls within the Bushmanland Arid Grassland vegetation type, the presence of rocky areas and drainage lines at the site suggest that several distinct plant communities are likely to be present

Typically, Bushmanland Arid Grassland is dominated by perennial grasses such as *Stipagrostis ciliata*, *S.obtusa*, *S.brevifolia* and shrubs such as *Salsola tuberculata*, *Rhigozum trichotomum* and *Phaeoptilum spinosum*. On deeper soils or along drainage lines low trees such as *Parkinsonia africana*, *Acacia mellifera* and *Boscia foetida* may occur. In wetter years, annual grasses and forbs may be abundant, including species such as *Aristida adscensionis*, *Schmidtia kalahariensis*, *Tribulis pterophorus* and *Aizoon canariense*. In terms of endemic and important taxa, *Tridentea dwequensis* is a bushmanland endemic while *Dinteranthus pole-evansii*, *Larryleachia dinteri*, *L.marlothii*, *Ruschia kenhardtensis*, *Lotononis oligocephala* and *Nemesia maxi* are endemic to the vegetation type (Mucina & Rutherford 2006). The vegetation type which dominates the site is extensive in nature. Any areas of sensitivity are likely to be restricted to the rocky outcrops or gravel plains.

Based on soil and vegetation patterns visible on satellite imagery of the site, a number of different landscape units within the site were identified and form the basis of the sensitivity mapping. Five different units were identified and mapped (refer to Figure 6.3):

» Deep sands which would be dominated largely by Stipagrostis ciliata. and which occur in the lowlands of the site. Likely to be of low sensitivity.
» Shallow or coarse sandy areas, which would also be dominated by Stipagrostis spp. Likely to be of low sensitivity. This unit and the above unit occupy the majority of the site and should form the focus area forof development at the site.
» Areas of exposed calcrete, which are likely to have low plant cover and would be dominated by Stipagrotis obtusa with scattered low shrubs. This is a potentially slightly more sensitive habitat as such calcrete plains may contain rare geophytes as well as succulents.
» Gravel or stony outcrops, which are likely to be dominated by low woody shrubs. Likely to be of higher ecological sensitivity due to higher plant and animal diversity.
» Drainage areas and wetlands. With higher plant cover and a greater proportion of taller woody elements. High sensitivity due to ecological function as well as habitat and biodiversity value.

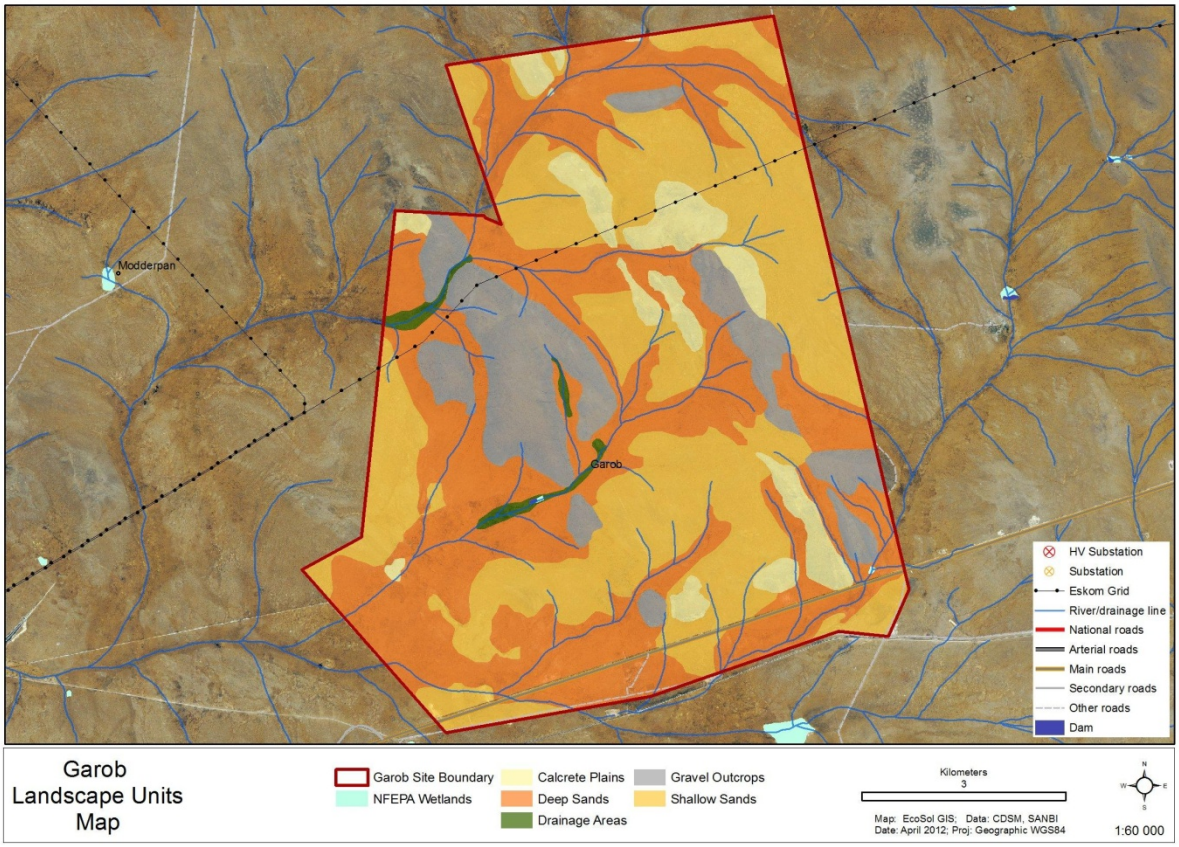


Figure 6.3: Landscape units of the proposed Garob Wind Farm as discerned from satellite imagery of the site. The drainage features represent the most sensitive habitat present while the gravel outcrops are also potentially more sensitive than the surrounding grassy plains on deeper sandy soils.

Listed Plant species

This area is characterised by relatively low diversity. The only listed species which is likely to occur at the site is *Hoodia gordonii*, which is listed as Data Deficient. A number of species protected under national and provincial legislation are, however, likely to occur at the site, and include *Boscia albitrunca*, *Hoodia gordonii, Aloe claviflora*, *Pachypodium succulentum* and *Haworthia venosa* subsp. *tessellata*. However, none of these species are restricted or likely to be highly abundant at the site.

Terrestrial Fauna

As many as 42 terrestrial mammal species potentially occur in the vicinity of the Garob Wind Farm site. This includes two species of conservation concern:

- the Black-footed cat *Felis nigripes* (Vulnerable) and
- the Honey Badger *Mellivora capensis* (SA RDB Endangered).

Both of these species are widely distributed across the arid and semi-arid areas of South Africa.

Ten frog species may occur within the site and of these only the Giant Bullfrog *Pyxicephalus adspersus* is of conservation concern and is listed as Near Threatened. Should this species occur at the site, it would be associated with temporary pans in the lowlands of the site. Based on the satellite imagery of the site as well as the National Freshwater Ecosystems Priority Assessment wetlands layer, there did not however appear to be any pans or suitable wetlands at the site and it is unlikely that this species occurs at the site. Given the overall paucity of mesic areas at the site, there do not appear be any areas that would be especially sensitive from an amphibian perspective.

Reptile diversity at the site is likely to be quite low and only 34 reptile species are known from the area. Nevertheless, the abundance of some reptile species at the site is likely to be quite high, and a number of lizards such as Desert Lizards, *Meroles spp*. and Sand Lizards, *Pedioplanis spp*., are likely to be abundant in the area. There are however no listed reptile species known from the area and impacts on reptiles are likely to be of low significance given the broad range of the species which are likely to occur at the site. In terms of reptile habitats, the site appears to quite homogenous in this regard and any rocky outcrops which may occur would be of significance for reptiles.

Bats

The presence and distribution of bats in the Northern Cape Province were recorded for the entire Province rather than in the locality of the proposed wind project site. According to Monadjem *et al*. (2010) 35 bat species may be found in the Province. Of the 35 species reported to occur in the Province, one is considered Vulnerable and five Near Threatened, 28 Least Concern, and one is Data Deficient according to the IUCN Red List criteria. A detailed list is given below:

Vulnerable:

- Percival's Short-eared *Trident Bat Cleotis percivali*

Near Threatened

- African Straw-coloured Fruit Bat *Eidolon helvum*
- Cape Horseshoe Bat *Rhinolophus capensis*
- Swinny's Horseshoe Bat *Rhinolophus swinnyi*
- Natal Long-fingered Bat *Miniopterus natalensis*
- Angolan Wing-gland Bat *Cistugo seabrae*

Least Concern

- Peters's Epauletted Fruit Bat *Epomophorus crypturus*
- Wahlberg's Epauletted Fruit Bat *Epomophorus wahlbergi*
- Angolan Soft-furred Fruit Bat *Lissonycteris angolensis*
- Egyptian Rousette *Rousettus aegyptiacus*
- Sundevall's Leaf-nosed Bat *Hipposideros caffer*
- Geoffroy's Horseshoe *Rhinolophus clivosus*
- Darling's Horseshoe Bat *Rhinolophus darling*
- Hildebrandt's Horseshoe Bat *Rhinolophus hildebrandtii*
- Lander's Horseshoe Bat *Rhinolophus landeri*
- Bushveld Horseshoe Bat *Rhinolophus simulator*
- Mauritian Tomb Bat *Taphozous mauritianus*
- Large Slit-faced Bat *Nycteris grandis*
- Egyptian Slit-faced Bat *Nycteris thebaica*
- Ansorge's Free-tailed Bat *Chaerephon ansorgei*
- Little Free-tailed Bat *Chaerephon pumilus*
- Midas Free-tailed *Bat Mops midas*
- Robert's Flat-headed Bat *Sauromys petrophilus*
- Egyptian Free-tailed Bat *Tadarida aegyptiaca*
- Long-tailed Serotine *Eptesicus hottentotus*
- Anchieta's Pipistrelle *Hypsugo anchietae*
- Lesser Woolly Bat *Kerivoula lanosa*
- Temminck's Myotis *Myotis tricolor*
- Cape Serotine *Neoromicia capensis*
- Banana Bat *Neoromicia nana*
- Zulu Serotine *Neoromicia zuluensis*
- Rüppell'sPipistrelle *Pipistrellus rueppellii*
- Rusty Pipistrelle *Pipistrellus rusticus*
- White-bellied House Bat *Scotophilus leucogaster*

Avifauna

The site falls within Bushmanland Arid Grassland vegetation type. To the south west of the site is the "Bushmanland Basin Shrubland" vegetation type, and to the north east is "Lower Gariep Broken Veld". This distribution of vegetation is relevant to avifauna in that the site is composed of short karoo type veld, with grassy components. This affects the species likely to occur on site, and is reflected in the data in Table 6.2 below, which shows that most of the Red Listed bird species recorded by the Southern African Bird Atlas Project (Harrison et al, 1997) in the area favour short open vegetation types such as these ones.

Avian microhabitats

The above vegetation description partially describes the habitat available and hence the species likely to occur in the study area. However, more detail is required in order to understand exactly where within the study area certain species will occur and how suitable these areas are for the relevant species. The habitats available to birds at a small spatial scale are known as micro habitats. These micro habitats are formed by a combination of factors such as vegetation, land use, anthropogenic factors, topography and others.

These micro habitats will be critically important in mapping the site in terms of avifaunal sensitivity and ultimately siting the proposed turbines within the affected farms. The micro habitats that the Red Listed species are most likely to use are shown in Table 6.1. The micro habitats on site will be identified during a field survey. At this stage, desktop examination of aerial photography has revealed karoo type shrubland and minor drainage lines and depressions present on the site.

Species of Special Concern (SSC) likely to occur in the study area

An approximate total of 150 species could occur in the area, based on what has been recorded by Harrison et al (1997). This is a relatively low diversity of species, reflecting the aridity and uniformity of the study area, as well as possibly the low number of counts or cards submitted (the more counts the more chance of detecting additional species).

The Red Listed bird species recorded across the four squares. In total 9 Red Listed species were recorded, comprising 3 Vulnerable (V) and 6 Near-threatened (NT) species. In addition, the White Stork *Ciconia ciconia* was included here as it is afforded protection internationally under the Bonn Convention on Migratory Species. Almost all of these Red Listed species are important with respect to wind energy facilities. The large terrestrial species such as the bustards, storks, flamingos and Secretarybird are all believed to be likely to collide with wind turbines, mainly based on their proven vulnerability to collision with overhead power lines. The smaller species such as the larks could most likely be impacted on through disturbance and habitat destruction. The raptors, such as Lesser Kestrel, are also believed to be at high risk of collision.

Impacts on non-Red Listed species that are believed to be relevant to this study are also considered. In particular, non-Red Listed species groups such as raptors, owls, lapwings, waterfowl, and thick-knees. Swallows, swifts and martins will also be relevant to this study due to the amount of time they spend in the air, which increases the chances of collisions.

Table 6.1: Red Listed species recorded in the four quarter degree squares considered relevant (2922CD, 2922CC, 2922DC, & 3022AB) during the Southern African Bird Atlas Project (Harrison et al, 1997).

Roberts #	Common Name	*Scientific Name*	Conservation status	Preferred micro habitat	Likelihood of occurring on site	Relative importance of site for national population of species	Likely interactions with proposed facility
183	Lesser Kestrel	*Falco naumanni*	V	Karoo shrubland, grassland	Probable	Low	Collision, disturbance, habitat destruction
230	Kori Bustard	*Ardeotis kori*	V	Karoo shrubland, grassland, woodland	Possible	Low	Collision, disturbance, habitat destruction
232	Ludwig's Bustard	*Neotis ludwigii*	V	Karoo shrubland, grassland	Possible	Low	Collision, disturbance, habitat destruction
84	Black Stork	*Ciconia nigra*	NT	Riverine, cliff	Unlikely	Low	Collision
96	Greater Flamingo	*Phoenicopterus ruber*	NT	Dam, pan, floodplain	Unlikely – could overfly	Low	Collision
118	Secretarybird	*Sagittarius serpentarius*	NT	Karoo shrubland, grassland, woodland	Possible	Low – unless breeding on site	Collision, disturbance, habitat destruction
172	Lanner Falcon	*Falco biarmicus*	NT	Karoo shrubland, grassland	Possible	Low – unless breeding on site	Collision, disturbance, habitat destruction
500	Cape Long-billed Lark	*Certhilauda curvirostris*	NT	Karoo shrubland, grassland	Possible	Low	Disturbance, habitat destruction
510	Sclater's Lark	*Spizocorys sclateri*	NT	Karoo shrubland, grassland	Possible	Low	Disturbance, habitat destruction
83	White Stork	*Ciconia ciconia*	BONN	Grassland, arable land, wetland, dam, karoo shrubland	Possible	Low	Collision, electrocution

V = Vulnerable; NT = Near-threatened; Bonn = Protected under the Bonn Convention on migratory species.

6.4. Social Characteristics of the Study Area and Surrounds

6.4.1 Economy

The proposed Garob Wind Energy Facility site is located in the sparsely populated, arid Karoo region, approximately 10 km east of the small former mining town of Copperton, within the Siyathemba Local Municipality. The main land uses in the study area are linked to extensive agriculture (stock farming), mining and game farming.

Livestock farming accounts for ~98.7% of agricultural land use and ~75% of the Siyathemba Local Municipality's agricultural GDP. At least 12 major crop types are cultivated in the Gariep Valley (mainly east of Prieska), the most important of which are maize and wheat, peanuts, lucerne (alfalfa) and table grapes. Stock farming operations are mainly based on small stock (sheep, goats) on spatially extensive commercial farms. Both wool and carcasses are produced. Game farming (hunting) is emerging as a key diversification strategy.

The mining sector historically played a major role in the local economy, with asbestos and copper/ silver (Copperton) mining the key activities. The closure of asbestos mines (mainly to the north of Prieska) as well as the Copperton mine (~10 km west of the Garob site) around the early 1990's has had a major lasting negative impact on the Siyathemba Local Municipality economy. Former mining towns (like Copperton) have dwindled to virtual ghost towns. The Copperton community is very isolated from employment opportunities and amenities. The lack of water poses a significant constraint to development of the Copperton area.

The Siyathemba Local Municipality tourism industry is in a fledgling stage, and largely based around the Gariep Valley, and specifically the town of Prieska. The R357 (Van Wyksvlei to Prieska, via Copperton and the proposed Garob site) has been proposed as a scenic drive with touristic potential within the 2006 Pixley ka Seme District Municipality SDF.

6.4.2 Population

The total population of the Pixley ka Seme District Municipality is ~165 000 (Census 2001). Of the total population Coloureds make up ~62% of the total, followed by Black Africans (~27%) and Whites (~10%). For the Siyathemba Local Municipality, the figures are ~64% Coloured, 26% Black African and 8% Whites. The Siyathemba Local Municipality makes up ~22% (36 000) of the total, making it the most populated local municipality in the district municipality. The demographic makeup of the Siyathemba Local Municipality is similar to that of the region. The population density for the region is 2.1 people per square kilometre. In terms of

future growth projections, a negative growth rate is forecast for the rural population and by 2015 the towns are also expected to show a negative growth rate 0f 1.29% (Pixley ka Seme District Municipality IDP).

6.4.3 Education

Based on Census 2001 data, ~25% of the Pixley ka Seme District Municipality population had no education, while 35% only had primary level of qualifications. The figures are essentially the same for the Siyathemba Local Municipality. The education levels in the region are low and can be attributed to the rural nature of the area together with the substantial number of previously disadvantaged population groups who did not have equal access to education in the past era.

According to the Municipal Profiles of 2002, the primary school population represented 46.3% of the total population of the district. There are 49 primary schools and 18 secondary schools and combined schools in the district. While the actual number of schools is generally satisfactory there is an acute shortage of schools in the remote areas of the district. As a result children often have to walk long distances to reach schools (Pixley ka Seme District Municipality IDP 2008/2009).

6.4.4 Employment levels

According to the Census 2001 data the unemployment rate in the Pixley ka Seme District Municipality was 21%[5]. The rate for the Siyathemba Local Municipality was 14%. In terms of employment the agricultural sector was the most important economic sector in the Pixley ka Seme District Municipality accounting for ~39% of the total working population. The commercial services sector accounted for ~23% of the employment opportunities. These two sectors combined therefore accounted for ~62% of all the employment opportunities in the area.

6.4.5. Noise receptors

Wind turbines emit noises at sufficient levels to propagate over large distances. There will be a number of winds turbines operating simultaneously in an area where there are noise-sensitive developments which increases the possibility that a noise impact could occur.

[5] A more recent estimate indicated an unemployment rate of 37% (Pixley ka Seme District Municipality IDP 2010/ 2011).

Three potential noise-sensitive developments (NSD) were identified in the area (within site proposed, as well as potential NSD's up to 2 km from boundary of facility). These NSDs are illustrated in Figure 6.4 below.

Figure 6.4: Potential Noise Sensitive Developments near the proposed site

6.4.6. Heritage and Palaeontological Profile

There are a range of heritage sites occurring in the larger region, and similar sites can be expected within the study area and on the site. Every site is relevant to the heritage landscape, but it is anticipated that few if any have conservation value, therefore no fatal flaws are expected.

Previous heritage studies were conducted to the west and south of the study site. All these studies recorded Early Stone Age (ESA) and Middle Stone Age (MSA) artefacts scattered over the landscape with MSA and LSA sites centered around pans. Stone kraals were also recorded. These features are, therefore, likely to occur on this site.

SCOPE OF THE WIND ENERGY FACILITY PROJECT CHAPTER 7

This chapter provides details regarding the scope of the proposed Garob Wind Energy Facility, including all required elements of the project and necessary steps for the project to be developed. The scope of the project includes construction, operation and decommissioning activities. This chapter also describes alternative options with regards to the proposed wind energy facility development, including the "do nothing" alternative.

7.1 Project Alternatives

7.1.1 Site Alternatives

Through the regional assessment site identification and selection process, juwi were guided to site/locate their proposed wind farm within an area/zone of preference (the site selection process undertaken is described in detail in Chapter 4). The regional site assessment involved testing the site against environmental and planning criteria, and the approach served as a site risk assessment tool from an environmental acceptability perspective – that is, a process to highlight or red-flag potential issues of concern prior to initiating a full EIA process for a proposed site. This site identification process is considered acceptable and therefore no location/site alternatives have been considered further.

7.1.2 Site-specific alternatives

Once sufficient information is available from an environmental and planning perspective for the broader 5 520ha site, a detailed micro-siting exercise will be undertaken to effectively 'design' the wind energy facility within the available site. As local level issues were not assessed in sufficient detail at the regional level, these issues are now being considered within the site-specific studies and assessments through the EIA in order to delineate areas of sensitivity within the broader area. Through the process of determining environmental constraining factors, the layout of the wind turbines and infrastructure can be appropriately planned. The overall aim of the planning process would be to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. Specialist software is available to assist developers in selecting the optimum position for each turbine. This micro-siting information will then be provided, and will inform the specialist impact assessments at the EIA phase. The planning process will also include the positioning of other ancillary infrastructure, including access roads,

laydown areas, power line corridors and the substation site. Feasible alternatives in this regard will be assessed in detail in the EIA phase.

7.1.3 Technology alternatives

This refers to alternative technologies for use in the establishment of the wind facility. There is a limited range of alternative technologies (turbines) for commercial-scale wind energy facilities. In addition, the technology is constantly evolving. Table 7.1 summarises the types of variables associated with existing wind turbine technologies. There are no significant differences from an environmental perspective between technologies. The technology provider has not yet been confirmed and will be decided after further wind analysis and a tender process. Note that juwi Renewable Energies would utilise the same make and model (and size) of turbine across the whole site.

Table 7.1: Variables associated with existing wind turbine technologies

Variables	Description
Type	The horizontal axis wind turbine completely dominates the commercial scale wind turbine market.
Size	Typical land-based utility scale wind turbines are in the 600 kW to 3 MW range.
Foundation	The foundation is usually poured concrete. Its size and shape is dictated by the size of the wind turbine and geotechnical considerations.
Tower	Towers are typically constructed from steel and/or steel. The height of towers generally varies between 80 m and 140 m.
Rotor	3- bladed rotor is standard.
Rotor Speed Control	Fixed or variable speed rotors
Gears	Geared and Gearless
Generator	Standard high speed generator (geared) or custom low-speed ring generator (gearless)
Other variables	Yaw gears, brakes, control systems, lubrication systems and all other turbine components are similar on modern wind turbines

7.1.4 The 'do nothing' alternative

The 'do-nothing' alternative is the option of not constructing the Garob Wind Energy Facility on the proposed site. This alternative would result in no environmental impacts on the site or surrounding area.

The electricity demand in South Africa is placing increasing pressure on the country's existing power generation capacity. There is therefore a need for additional electricity generation options to be developed throughout the country. The decision to expand South Africa's electricity generation capacity, and the mix of

generation technologies is based on **national policy** and informed by on-going strategic planning undertaken by the national Department of Energy (DoE), the National Energy Regulator of South Africa (NERSA) and Eskom Holdings Limited (as the primary electricity supplier in South Africa). The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least-cost energy service in many cases and more so when social and environmental costs are taken into account.

The generation of electricity from renewable energy in South Africa offers a number of socio-economic and environmental benefits. These benefits are explored in further detail in the South Africa Renewable Energy Feed-in Tariff (REFIT) Regulatory Guideline published by NERSA (March 2009), and include:

» **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of supplementing the power available. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
» **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, where compared with wet cooled conventional power stations. This translates into revenue saving of R26.6 million. As an already water stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly as the detrimental effects of climate change on water availability are experienced in the future.
» **Exploitation of our significant renewable energy resource:** At present, valuable national resources (including biomass by-products, solar insulation and wind) remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.
» **Pollution reduction:** The release of by-products of fossil fuel burning for electricity generation have a particularly hazardous impact on human health, and contribute to ecosystem degradation.
» **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner, contributing to the mitigation of climate change through the reduction of greenhouse gas emissions. South Africa as a nation is estimated to be responsible for 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.

- **Support for international agreements and enhanced status within the international community:** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.
- **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities has significant potential for job creation in South Africa.
- **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.
- **Support to a new industry sector:** The development of renewable energy offers an opportunity to establish a new industry within the South African economy.
- **Protecting the natural foundations of life for future generations:** Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change; thereby securing the natural foundations of life for generations to come.

At present, South Africa is some way off from exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal based power generation, with the country's significant renewable energy potential largely untapped to date.

Within a policy framework, the development of renewable energy in South Africa is supported by the White Paper on Renewable Energy (November 2003), which has set a target of 10 000 GWh of renewable energy contribution to final energy consumption by 2013. The target is to be achieved primarily through the development of wind, biomass, solar and small-scale hydro. DME's macroeconomic study on renewable energy, developed under the now completed Capacity Building in Energy Efficiency and Renewable Energy (CaBEERE) project, has established that the achievement of this target would provide a number of economic benefits, including increased government revenue amounting to R299 million, increased GDP of up to R1 billion per year and the creation of an estimated 20 500 new jobs. In addition, the development of renewable energy beyond the 10 000 GWh target holds further employment benefits and would maximise the number of jobs created per TWh (South Africa Renewable Energy Feed-in Tariff (REFIT) Regulatory Guideline published by NERSA (March 2009).

Through research, the viability of the Garob Wind Energy Facility has been established, and juwi proposes that up to 55 turbines can be established as part of the facility. The 'do nothing' alternative will not assist the South African

government in reaching the set targets for renewable energy. In addition the Northern Cape's power supply will not be strengthened by the additional generated power being evacuated directly into the Provinces' electricity grid.

The current land use of the site would not be lost with the implementation of a wind energy facility. There would therefore not be any significant impact on current land use associated with the project being developed, or not.

The 'do nothing' alternative is, therefore, not a preferred alternative and will therefore not be assessed in further detail during the EIA Phase.

7.2 Project Construction Phase

In order to construct the proposed wind farm and associated infrastructure, a series of activities will need to be undertaken. The number of people in a construction crew will be determined during the EIA phase. There may be more than one crew operating on the site at any one time. Construction crews will constitute mainly skilled and semi-skilled workers. No contractors (other than security personnel) will reside on the site at any time during the construction or operational phases.

7.2.1. Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to, geotechnical survey, site survey and confirmation of the turbine micro-siting footprint, survey of on-site-substation site/s and survey of power line servitude/s to determine tower locations.

7.2.2 Establishment of Access Roads to the Site

The proposed site is accessible from the R357 from Copperton to Prieska. Access/haul roads to the site (if required) as well as internal access roads within the site are required to be established prior to the commencement of construction. As far as possible, existing access roads would be utilised, and upgraded where required. Within the site itself, access will be required between the turbines for construction purposes (and later limited access for maintenance). Special haul roads of up to 6m in width may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation. The internal service road alignment will be informed by the final micro-siting/positioning of the wind turbines.

These access roads will have to be constructed in advance of any components being delivered to site, and will remain in place after completion for future access and possibly access for replacement of parts if necessary. It is proposed that in

preparing the access road, a portion of it (up to 6m in width) will be constructed as a permanent access road and the remainder as a temporary access road that can be de-compacted and returned to its pre-construction condition.

7.2.3. Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each turbine, the establishment of internal access roads (as discussed in 7.2.2 above) and excavations for foundations (refer to 7.2.4 below). These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site. Figure 7.1 illustrates these areas.

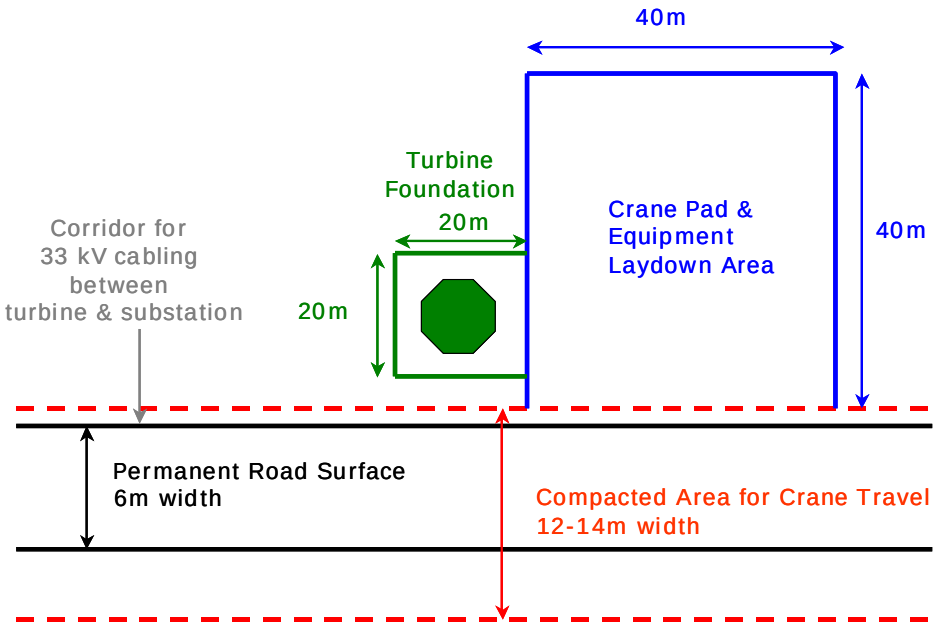


Figure 7.1: Diagrammatic representation of a typical layout of components

Site preparation will be undertaken in a systematic manner to reduce the risk of the open ground to erosion. In addition, site preparation will include search and rescue of floral species of concern (where required), as well as identification and excavation of any sites of cultural/heritage value (where required).

7.2.4 Construct Foundation

Concrete foundations will be constructed at each turbine location. Foundation holes will be mechanically excavated to a depth of approximately 4 m, depending on the local geology. Concrete may to be brought to site as ready-mix or batched on site if no suitable concrete suppliers are available in the vicinity. The reinforced concrete foundation will be poured and will support a mounting ring. The foundation will then be left up to a week to cure.

Figure 7.2: Photograph illustrating the construction of the foundation for a wind turbine (photo sourced from www.blm.gov)

7.2.5. Transport of Components and Equipment to Site

The wind turbine, including the tower, will be brought to the site by the turbine supplier in sections on flatbed trucks. Turbine units which must be transported to site consist of: the tower (in segments), hub, nacelle, and three rotor blades. The individual components are defined as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989)[6] by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). In addition, components of various specialised construction and lifting equipment are required on site to erect the wind turbines and need to be transported to site. In addition to the specialised lifting equipment/cranes, the normal civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, site offices etc.).

The components required for the establishment of the substation/s (including transformers) as well as the power line (including towers and cabling) will also be transported to site as required.

[6] A permit will be required for the transportation of these abnormal loads on public roads.

The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (e.g. widening on corners), accommodation of street furniture (e.g. street lighting, traffic signals, telephone lines etc) and protection of road-related structures (i.e. bridges, culverts, portal culverts, retaining walls etc) as a result of abnormal loading.

The equipment will be transported to the site using appropriate National and Provincial roads, and the dedicated access/haul road to the site itself

7.2.6. Establishment of lay down areas on site

Laydown areas will need to be established at each turbine position for the storage and assembly of wind turbine components. The laydown area will need to accommodate the cranes required in tower/turbine assembly. Laydown and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site.

In addition a number of construction compound areas will need to be established around the site. These will be temporary structures for site offices, storage and safe refuelling areas.

7.2.6. Construct Turbine

A large lifting crane will be brought on site. It will lift the tower sections into place. The nacelle, which contains the gearbox, generator and yawing mechanism, will then be placed onto the top of the assembled tower. The next step will be to assemble or partially assemble the rotor (i.e. the blades of the turbine) on the ground. It will then be lifted to the nacelle and bolted in place. A small crane will likely be needed for the assembly of the rotor while a large crane will be needed to put it in place.

7.2.7. Construct Substation/s

One or more substations will be constructed within the site. The turbines will be connected to the substation via underground cabling where ever possible. The position of the substation will be informed by the final micro-siting/positioning of the wind turbines. The layout of the turbines will determine the optimum position for the construction of a substation.

The construction of the substation would require a survey of the site; site clearing and levelling and construction of access road/s to the substation site (where required); construction of substation terrace and foundations; assembly, erection

and installation of equipment (including transformers); connection of conductors to equipment; and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

7.2.8. Establishment of Ancillary Infrastructure

A workshop as well as a contractor's equipment camp will also be required to be constructed. Temporary storage areas and a construction compound (sizes and numbers to be confirmed later in process). Service building(s) (number, size and location to be confirmed later in process) are also required.

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

7.2.9. Connection of Wind Turbines to the Substation

Each wind turbine will be connected to an optimally positioned substation by underground electrical cables where ever possible. The installation of these cables will require the excavation of trenches, approximately 1 m in depth within which these cables can then be laid. The underground cables will be planned to follow the internal access roads, where possible.

7.2.10. Connect Substation/s to Power Grid

A 132 kV power line will connect the substation/s to the electricity distribution network/grid. Two alternative points of connection include: a) via a new 132kV power line to connect at the Cuprum Substation, or b) a loop in and out of the Burchell-Cuprum 132 kV power line that crosses the site. The connection point to the Eskom power grid will be confirmed through a network planning exercise. A route for the power line will be assessed, surveyed and pegged prior to construction.

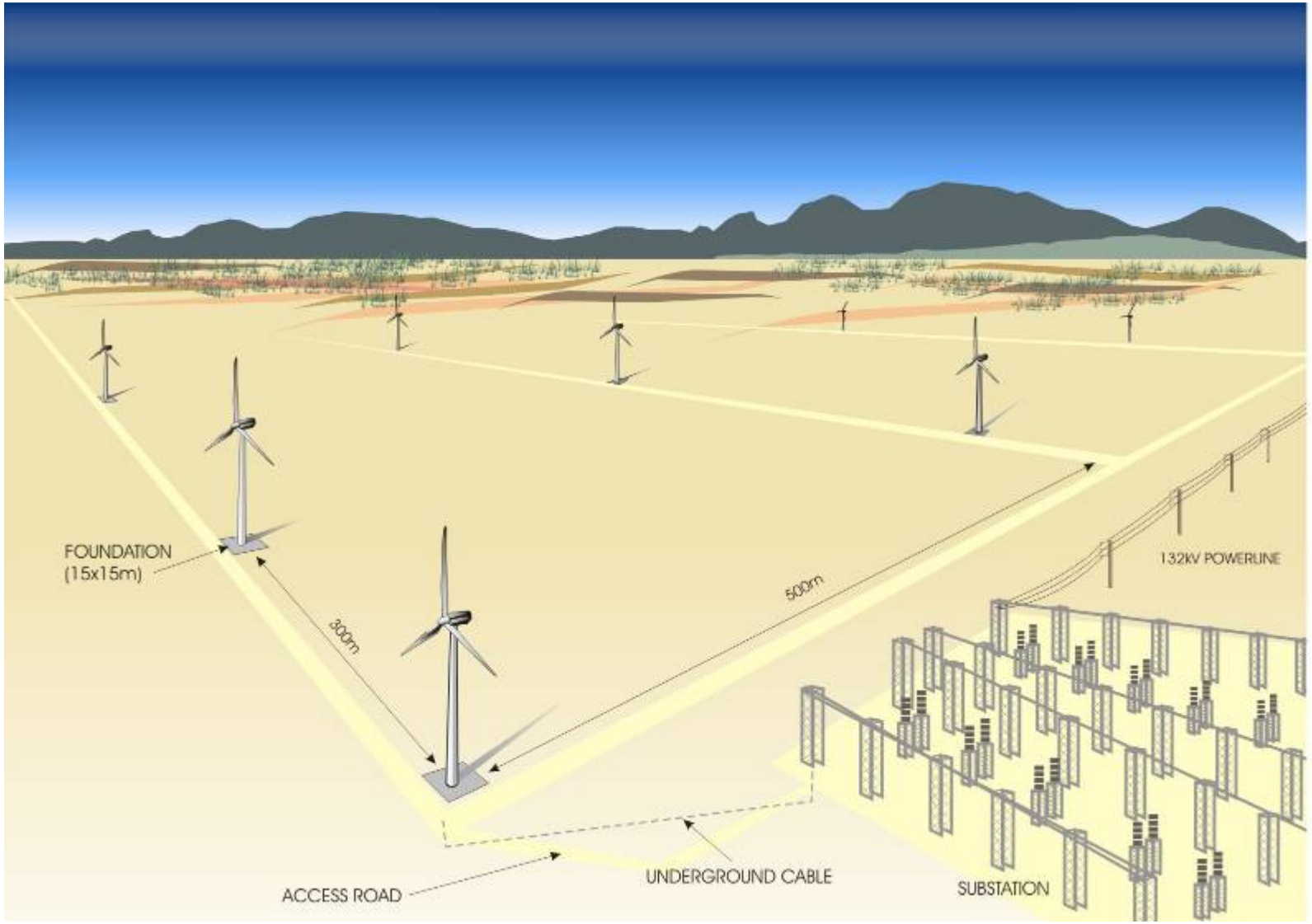


Figure 7.3: Artists impression of a portion of a wind energy facility, illustrating the various components and associated infrastructure

7.2.11. Commissioning

Prior to the start-up of a wind turbine, a series of checks and tests will be carried out. This will include both static and dynamic tests to make sure the turbine is working within appropriate limits. Grid interconnection and unit synchronisation will be undertaken to confirm the turbine and unit performance. Physical adjustments may be needed such as changing the pitch of the blades. The schedule for this activity will be subject to site and weather conditions.

7.2.12. Undertake Site Remediation

As construction is completed in an area, and as all construction equipment is removed from the site, the site rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.

7.3. Project Operation Phase

It is not known at this stage exactly how many people will be responsible for monitoring and maintenance of the facility. It is anticipated that there could be security and maintenance staff required on site.

Each turbine within the wind energy facility will be operational except under circumstances of mechanical breakdown, inclement weather conditions or maintenance activities.

7.3.1. Maintenance

The wind turbine will be subject to periodic maintenance and inspection. Periodic oil changes will be required. Any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation.

7.4. Decommissioning

The turbine infrastructure which will be utilised for the proposed Garob Wind Farm is expected to have a lifespan of approximately 20 - 30 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that refurbishment of the infrastructure of the facility discussed in this EIA would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.

The following decommissioning activities have been considered to form part of the project scope of the proposed wind farm.

7.4.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of decommissioning equipment.

7.4.2. Disassemble and Replace Existing Turbine

A large crane will be brought on site. It will be used to disassemble the turbine and tower sections. These components will be reused, recycled or disposed of in accordance with regulatory requirements. All parts of the turbine would be considered reusable or recyclable except for the blades.

SCOPING OF ISSUES ASSOCIATED WITH THE GAROB ENERGY FACILITY CHAPTER 8

Construction activities for wind energy projects typically include:

» land clearing for site preparation and access routes;
» transportation of supply materials and fuels;
» construction of foundations involving excavations and placement of concrete;
» construction of a substation, underground and above ground power lines;
» operating cranes for unloading and installation of equipment;
» commissioning of new equipment, and
» waste removal and rehabilitation of disturbed sites

Operational activities include regular maintenance of the site infrastructure.

Decommissioning activities may include removal of project infrastructure and site rehabilitation.

Environmental issues associated with construction and decommissioning activities may include, among others, noise impacts, heritage impacts, soil erosion, and threats to biodiversity and ecological processes, including habitat alteration and impacts to wildlife.

Environmental issues specific to the **operation** of a wind farm could include visual impacts; noise produced by the spinning of rotor blades; avian/bat mortality resulting from collisions with blades and/or barotrauma; and mortality, injury and disturbance to other faunal species.

The significance of impacts associated with a particular wind farm is dependent on site-specific factors, and therefore impacts can be expected to vary significantly from site to site.

The environmental issues associated with all phases of the proposed Garob Wind Energy Facility have been identified through a scoping evaluation undertaken in accordance with the requirements of the EIA Regulations. This chapter serves to describe and evaluate the identified potential environmental impacts associated with the wind farm project, and to make recommendations for further studies required to be undertaken in the EIA phase, and/or recommendations for the management of these impacts through inclusion in the Environmental Management Programme (EMP).

Tables 8.1 and Table 8.2 provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed wind farm project respectively. Impacts associated with decommissioning are expected to be similar to those associated with construction. Potential direct and indirect impacts of the proposed wind farm are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process. Specialist scoping reports are included within Appendix F to M.

In identifying and evaluating impacts associated with the proposed project, it has been assumed that although during the **operational phase** the area affected will be limited and comprise up to 55 wind turbines in total (with a hub height of up to 120m each), access roads and a substation footprint, during **construction** a larger area within the approximately 5520 ha area being considered for the wind farm footprint could suffer some level of disturbance as a result of the required activities on site. However, once construction is complete, only a small portion of this area (typically less than 5%) will be permanently impacted by infrastructure associated with the wind farm.

The **cumulative impacts** associated with the proposed wind farm are expected to be associated with the scale of the project, i.e. up to 55 wind turbines will be located on the proposed site. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, potential noise impacts, potential vegetation impact, potential heritage impact and potential impacts on avifauna, i.e. bats and birds in the surrounding area. Other cumulative impacts may arise from other neighbouring proposed wind and solar energy facilities. Cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase of the process.

It must be noted that the draft scoping report is a desktop study undertaken by specialists, and all potential impacts identified through the scoping phase (indicated as being of low to high significance) will be further assessed and confirmed during the EIA phase.

Table 8.1: Evaluation of potential impacts associated with the CONSTRUCTION PHASE of the proposed Garob Energy Facility

Potential Visual Impacts:

Potential visual impacts during the construction phase on observers in close proximity to the wind farm and power line are expected to be of a short duration and limited to the site.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential visual impacts associated with the construction phase on observers in close proximity to the facility and power line.	Construction of the wind energy facility.	Local	None.
The potential visual impact of the construction of ancillary infrastructure on observers residing in close proximity of the facility.	Construction of associated infrastructure of the wind energy facility (i.e. the substation, associated power line, access road to the site, internal access roads within the site, etc as determined).	Local	None.

Gaps in knowledge & recommendations for further study:

The potential visual impacts need to be assessed in greater detail during the EIA phase of the project.

It is recommended that:

» It is therefore recommended that the severity of the potential visual impact be assessed in further detail in the EIA phase.
» Additional spatial analyses must be undertaken in order to create a visual impact index that will further aid in determining potential visual impact.
» Specific spatial criteria need to be applied to the visual exposure of the proposed facility in order to successfully determine visual impact and ultimately the significance of the visual impact.

Potential Impacts on Agricultural potential:

The agricultural potential of the site is very low and limited to extensive grazing due to the very low rainfall in the area. The climate of the area is typical of the desert and is categorised as arid. The mean annual rainfall of the area where the site is located, is approximately 160mm. This region is non-arable. The "best use'' for the area is for grazing with sheep, goats and beef cattle. The grazing capacity of the region varies between 26 ha/LSU and 32 ha/LSU

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of agricultural land	Construction of proposed wind energy facility and associated infrastructure	Local in terms of the activity and will be associated with the activity only. The impacts are considered to be of low significance due to the low agricultural potential of the site.	None

Gaps in knowledge & recommendations for further study:

A detailed site visit will have to be conducted as part of the EIA level investigation and the following parameters should be investigated:

» Land capability, current land-use and degradation status of the agricultural resources (i.e. soil and vegetation)
» Agriculturally sensitive areas or areas with high agricultural value (i.e. lands, wetlands and watercourses)
» Agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, etc.) that will be impacted upon.

Potential Impacts on Soil and current land use:

The proposed development of the Garob Wind Energy Facility will not have large impacts on the current land use of the area. This is mainly due to the low agricultural potential, soils and climatic constraints for the site. The susceptibility of the soils to water and wind erosion is categorised as low to moderate while the soil loss potential is low.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Soil degradation due to contamination	Spillages of oil, diesel, petrol or other contaminants by the vehicles and equipment, may lead to soil degradation due to contamination. Contamination of the soil may also take place in proposed maintenance and storage sites	Local (construction areas only)	No specific 'no go' areas have been identified at this stage; and these will be investigated further during the EIA phase.
Soil erosion due to increased and concentrated storm water run-off	Heavy rainstorms do occur in the area. Depending on the placement of the wind turbines and other infrastructure, as well as the erodibility of the soils and the slopes on the site,	Local (construction areas only)	No specific 'no go' areas have been identified at this stage and will be investigated further during

	run-off of stormwater may be increased and concentrated, with both direct and secondary effects on the soil, vegetation and other resources downstream.		the EIA phase.
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	Improper placement, construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to the degradation of the soil surface and result in soil erosion (both wind and water erosion).	Local (construction areas only)	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Siltation of watercourses	Improper placement and maintenance of infrastructure, as well as poor stormwater management, may lead to water erosion and siltation of water courses downstream.	Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Dust production	Improper construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to dust production.	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.

Gaps in knowledge & recommendations for further study:

Recommendations:

A detailed site visit will have to be conducted as part of the EIA level investigation and the following parameters should be investigated:

» Geology and soils, with special reference to sensitivity to erosion and factors contributing to erosion (i.e. slopes, etc.)

Potential impacts on Vegetation and Terrestrial Fauna:

The site falls within the Bushmanland Arid Grassland vegetation type. This is an extensive vegetation type that stretches from Aggeneys in the west to Prieska in the west. Less than 1% has been transformed and the vegetation type is classified as Least Threatened. Potential impacts on vegetation will be restricted to those impacts that would affect vegetation communities, their habitats and their constituent plant species. The impacts could affect ecological processes and consequently ecosystem function.

There are two mammal species of conservation concern that have a geographical distribution that includes the site and habitat preference that includes the type of habitat that could potentially occur on site. This includes the following species:

» Black-footed cat *Felis nigripes* (Vulnerable)
» Honey Badger *Mellivora capensis* (SA RDB Endangered)

However as both these species are widely distributed across the arid and semi-arid areas of South Africa, the development would not amount to a significant amount of habitat loss for these two species.

Ten frog species may occur within the site and of these only the Giant Bullfrog *Pyxicephalus adspersus* is of conservation concern and is listed as Near Threatened. Should this species occur at the site, it would be associated with temporary pans in the lowlands of the site.

Reptile diversity at the site is likely to be quite low and only 34 reptile species are known from the area. There are however no listed reptile species known from the area and impacts on reptiles are likely to be of low significance given the broad range of the species which are likely to occur at the site. In terms of reptile habitats, the site appears to be quite homogenous in this regard and any rocky outcrops which may occur would be of significance for reptiles.

The greatest risk to the vegetation and flora would be during the construction phase of the wind farm. No fatal flaws are anticipated from a botanical viewpoint but there are a few 'red flags'. The latter concerns the possible presence of rare and endemic plant species in the study area.

Issue	**Nature of Impact**	**Extent of Impact**	**'No go' areas**
Destruction of plant cover and vegetation	Vegetation clearing for turbines, lay down areas, roads, buildings etc could impact listed and protected plant species.	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Impacts on protected plant species	Vegetation clearing for turbines, lay down areas, roads, buildings etc could impact listed and protected plant species.	Local	
Impacts on terrestrial fauna and associated habitats	Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems. Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as noise or fire	Local	

Alien plant invasion, habitat fragmentation and loss of landscape connectivity.	Indirect ecological impacts such as alien plant invasion, habitat fragmentation and loss of landscape connectivity.	Local	

Gaps in knowledge & recommendations for further study:

The following will be undertaken in the EIA Phase of the study:

Vegetation

» Carry out fieldwork to locate and describe the vegetation on the study area, key focus on the impact footprint.
» Determine the species present and localities within each vegetation type present.
» Generate a vegetation map showing the sites in relation to any Critical Biodiversity Areas and links to ecological corridors and support areas.
» Determine whether the study area falls wholly or partially within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected.

Terrestrial Fauna

» Describe and assesses the terrestrial fauna present in the area that will be affected by the proposed development.
» Conduct a faunal assessment that can be integrated into the ecological study.
» Describe the existing impacts of current land use as they affect the fauna.
» Clarify species of special concern (SSC) and that are known to be:
» endemic to the region;
» that are considered to be of conservational concern;
» that are in commercial trade (CITES listed species);
» or, are of cultural significance

It is recommended that the following be established

» The key ecological “drivers” of ecosystems on the site and in the vicinity, such as fire.
» Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. corridors such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and vegetation boundaries such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
» Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.

In addition, the presence of Red List and endemic species will be given special attention to ensure that they are carefully taken into consideration when designing layouts of the proposed turbines. This information will be summarized together with the sensitivity of plant communities and habitats in a sensitivity map that would be crucial to inform the design phase of the proposed project.

Potential Impacts on Avifauna (birds):

Although the final footprint of the wind farm is likely to be relatively small, the construction phase of development inevitably incurs quite extensive temporary damage or permanent destruction of habitat, which may be of lasting significance in cases where wind farm sites coincide with critical areas for restricted range, endemic and/or threatened species. During the construction phase and maintenance of power lines and substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the leveling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimise the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of bird habitat	During the construction phase and maintenance of power lines and substations, some habitat destruction and alteration inevitably takes place. Since the site is situated in an extremely uniform area this impact is not anticipated to of high significance for most of the site. The exception to this will be some of the areas identified in the sensitivity mapping exercise, in particular any surface water sources or significant drainage lines.	Local	Areas of surface water on site
Disturbance of birds	Construction activities will have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat. This is unlikely to be of high significance for most species, unless breeding on site. The likelihood of target species breeding on site will be assessed during the EIA Phase.	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.

Displacement of birds from the site and barrier effects	The likelihood of this impact being significant will be assessed during the EIA Phase and is related to how much birds actually use and depend on the site. At this stage it is not anticipated to be a significant impact.	Local and Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase

Gaps in knowledge & recommendations for further study:

The EIA Phase will conduct the following activities:

» The micro habitats on site will be assessed for their suitability for the key species, and the list of bird species will be refined based on findings.
» The sensitivity zones and suitable buffer zones will be identified and mapped.
» The impacts identified in this scoping phase study will be assessed formally according to the supplied criteria.
» If a pre-construction bird monitoring programme has not already been initiated, a framework for such a monitoring programme will be prepared.

Impacts on bats:

Some foraging habitat will be destroyed by the construction of the turbines and associated infrastructure. This impact is a negative and local impact that will be more significant during construction than during the operation of the wind farm.

During the construction phase of the project possible bat roosts may be impacted by earthworks and large machinery. Winter roosts, often used for hibernation, may take bats closer to wind farms as their movement patterns change. Bats are known to use topographical features such as ridges to navigate during their migrations. In addition, they may use these features as temporary roosts, foraging areas and shortcuts.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Destruction of foraging habitat and roosts	A certain amount of habitat destruction will results from construction of foundations of the turbines, access roads and associated infrastructure. Wherever possible natural vegetation should be left intact	Local and Regional	Areas of surface water on site

	and not cleared. Disturbed areas should also be rehabilitated appropriately.		

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» As no site visit was conducted during the scoping phase and available information is limited to species reported to occur in the area, no knowledge is available on buildings and other infrastructure present on the site, all of which could provide roosting or feeding facilities for bats.

Recommendations:

» Species presence estimates to be determined through the use of a bat detector system operated while walking transect lines across the farm;
» Surveys that will assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites, trees, will be carried out.

Further investigation will be done if any areas with high potential on or adjacent to the site are identified. These surveys will be done during the daytime, including dusk and dawn periods conducted at all infrastructure currently present on the farm.

Potential impacts on Heritage Resources:

There are a range of heritage sites occurring in the larger region, and similar sites can be expected within the study area and on the site. Every site is relevant to the heritage landscape, but it is anticipated that few if any have conservation value, therefore no fatal flaws are expected.

Previous heritage studies were conducted to the west and south of the study site. All these studies recorded Early Stone Age (ESA) and Middle Stone Age (MSA) artefacts scattered over the landscape with MSA and LSA sites centred around pans. Stone kraals were also recorded. These features are, therefore, likely to occur on this site.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on archaeological finds	The construction phase of the wind energy facility could directly impact on surface and subsurface	Local	No 'no- go' areas have not been identified at this stage.

	archaeological sites. There is a medium to high likelihood of finding Stone Age sites scattered over the study area. There is an increased likelihood of finding material around pans if any occur within the study area. The construction of the wind farm facility could have a low to medium impact on a local scale.		
Impacts on historical finds	The construction of the wind energy facility can directly impact on both the visual context and sense of place of historical sites. There are few structures identified in the south of the study area. Due to the visual nature of wind farm facility it can also have a direct impact on the sense of place as well as the cultural landscape. The wind farm facility will have a low to medium local impact due to the general physical nature of wind facilities. The sense of place of cultural sites and the cultural landscape will be impacted on a local scale and the impact will be medium.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on burials and cemeteries	The construction and operation of the wind farm facility could directly impact on marked and unmarked graves. Graves dating	Local	No 'no- go' areas have not been identified at this stage.

	to the Stone Age can be expected especially close to the river with more recent formal and informal cemeteries anywhere else on the landscape. The facility could have a low to medium impact on a local scale		

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

The study area was not subjected to a field survey as this will be done in the EIA phase. It is assumed that information obtained for the wider area is applicable to the study area

Recommendations:

During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

- Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
- The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon, ensuring that all the requirements of SAHRA are met.
- A Palaeontological Impact Assessment will also be conducted.

Potential noise impacts:

Increased noise levels are directly linked with the various activities associated with the construction of the wind energy facility and related infrastructure. The specific activities relating to construction of the wind energy facility will only be known during the EIA phase of the project. However, in general construction activities may include the following:

- construction of access roads,
- establishment of turbine tower foundations and electrical substation(s),
- establishment of foundations for photovoltaic arrays,
- the possible establishment, operation and removal of concrete batching plants,

» the construction of any buildings,
» digging of trenches to accommodate underground power cables; and
» the erection of turbine towers and assembly of wind turbine generators.
» The equipment likely to be required to complete the above tasks will typically include:

excavator/grader, bulldozer, dump trucks, vibratory roller, bucket loader, rock breaker, (potentially) drill rig, excavator/grader, bulldozer, dump truck, flatbed trucks, concrete truck(s), cranes, fork lift and various 4WD and service vehicles.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts due to construction equipment	Use of construction equipment on site will generate some level of noise.	Local	Cannot be determined at this stage.
Noise impacts due to construction traffic	Additional traffic to and from the site, as well as traffic on the site will be a significant noise source	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is no information available regarding the existing soundscape of the area.
» Projected impacts from the construction phase can only be modelled once more information regarding the duration of construction and equipment used are known.

Recommendations:

It is recommended that the potential noise impact be investigated in more detail in the EIA Phase. The following information is considered critical:

» The prevailing night-time background ambient noise levels,
» The available meteorological data,
» The exact locations of the various wind turbine generators within the wind farm development footprint,
» The confirmation of the noise-sensitive developments, and;
» An overview of the equipment, processes and schedules for the construction phase.

The following work is planned for the EIA Phase:

» A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying noise-sensitive developments,
» Currently identified (potential) Noise Sensitive Developments (NSDs) will be investigated and any additional NSDs will be identified. Their relative

sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).

» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the WEF on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for the construction phase

» Using the calculated noise levels at the identified NSDs, the projected significance of WEF will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed WEF.

Potential impacts on the social environment:

A number of key social issues are potentially associated with the construction of the proposed wind energy facility. The potential positive impacts associated with the construction phase relate to the creation of limited employment and skills development opportunities. The potential negative impacts are linked to the presence of construction workers on the site and in the area, the impact on local roads (transport of turbine components), and potential opportunistic in-migration and labour stranding.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impact on farming activities	Disruption of farming activities due to the presence of construction workers.	Local	N/A
Influx of job seekers into the area	The influx of job seekers may result in an increase in sexually transmitted diseases, including HIV/AIDS; increase in prostitution; increase in alcohol and drug related incidents; increase in crime; and creation of tension and conflict in the community.	Local	N/A
Employment creation	Creation of employment and business opportunities during the	Local	N/A

	construction phase		
Skills development and training	Creation of potential training and skills development opportunities for local communities and businesses	Local and Regional	N/A
Promotion of clean, renewable energy	Provision of clean, renewable energy source for the national grid	Local, Regional and National	N/A

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» Census, or sources based projections on the Census 2001 data. The writing of this report coincides with Census 2011 – the first comprehensive community level count undertaken since 2001. An interim Community Survey was undertaken by StatsSA in 2007 (Local Municipal level). However, Census 2001 remains the most recent community/ ward level, actual count data currently available. Final data from Census 2011 will be available in early 2013. Therefore, it should be noted that the 2001 Census data is dated. Where possible this data has been up-dated by projections, derived from Census 2001. While this data does provide useful information on the demographic profile of the affected area, the actual data is dated and should be treated with care.

Recommendations:

Methodology to be undertaken for the EIA phase:

» Review of existing project information, including the Planning and Scoping Documents;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented.

The following typical, generic project information is required in order to inform the Social Impact Assessment (Including all related infrastructure such as transmission lines, access roads, office and warehouse components):

» Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report;
» A draft illustration (plan) of the proposed lay-out(s) of the wind turbines (including an indication of the phasing sequence on the site), supporting structures and infrastructure;
» Duration of the construction phase (months);

- Number of people employed during the construction phase;
- Breakdown of number of people employed in terms or low skilled, semi-skilled and skilled;
- Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;
- Estimate of total capital expenditure for construction phase;
- Indication of where construction workers will be housed (on site or in nearest town?);
- Opportunities for on-site skills development and training;
- Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the large components associated with a WEF will be transported to the site and assembled on the site;
- The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required and duration of each trip;
- Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

Table 8.2: Evaluation of potential impacts associated with the OPERATION PHASE of the proposed Garob Wind Farm

Potential Visual Impacts:

The result of the initial viewshed analyses for the proposed Garob Wind Energy Facility is shown on Figure 8.1. The viewshed analysis was undertaken from a number of provisional turbine positions as at offsets of 120m above average ground level (i.e. the approximate hub height of the proposed wind turbines). This was done to determine the general visual exposure of the area under investigation, simulating the proposed turbine structures associated with the facility. It must be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario.

Figure 8.1 indicates areas from which any number of turbines (with a minimum of one turbine) could potentially be visible as well as proximity offsets from the proposed development area. The proposed facility will have a large core area of potential visual exposure on the project site itself, and within a 5km offset. Sensitive visual receptors within this visually exposed zone include users of the R357 in the south of this zone and residents of the settlements of *Annex Boesmansberg, Boesmansberg, Platsambok* and *Nelspoortjie*. Potential visual exposure is slightly reduced in the medium distance (i.e. between 5 and 10km), with some visually screened areas in the east and north east (beyond the local hills), and to a lesser extent to the south. Sensitive visual receptors again include users of the R357 in the south west, as well residents of Copperton. In addition, residents of homesteads and settlements are also likely to be impacted upon. These include *Louretha, Sunnyside, Gemoed, Grootpan* and *Drielingspan*. In the longer distance (i.e. beyond the 10km offset), the extent of potential visual exposure is further reduced. Visually exposed areas occur mainly in the north and south west. Areas in the north east, east and south east are largely shielded from potential visual impact. Sensitive visual receptors include users of short stretches of the R386 and R403 in the east of the study area, and various secondary roads south of Copperton. A few homesteads and settlements (approximately 9) may also be impacted upon. The town of Prieska is not likely to be visually exposed.

Issue	Nature of Impact	Extent of Impact	'No go' areas
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads (i.e. the R357, R386 and R403) and secondary roads in close proximity[14] to the proposed facility and within the region[15].	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.

[14] For the purpose of this study, close proximity is considered to be within 10km of the proposed wind energy facility. This would be a medium distance view where the structures would be easily and comfortably visible and constitutes a high visual prominence.

The potential visual impact on the town of Copperton.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Potential cumulative visual impacts of the wind farm and associated infrastructure.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Gaps in knowledge & recommendations for further study: The potential visual impacts need to be assessed in greater detail during the EIA phase of the project. It is recommended that: » the severity of the potential visual impact be assessed in further detail in the EIA phase. » Additional spatial analyses must be undertaken in order to create a visual impact index that will further aid in determining potential visual impact. » Specific spatial criteria need to be applied to the visual exposure of the proposed facility in order to successfully determine visual impact and ultimately the significance of the visual impact. » Photo simulations of critical viewpoints be undertaken where required, in order to aid in the visualisation of the envisaged visual impact.			

[15] For the purpose of this study, the region is considered to be beyond the 10km radius of the proposed wind energy facility. This would be a longer distance view where the facility would become part of the visual environment, but would still be visible and constitutes a medium to low visual prominence.

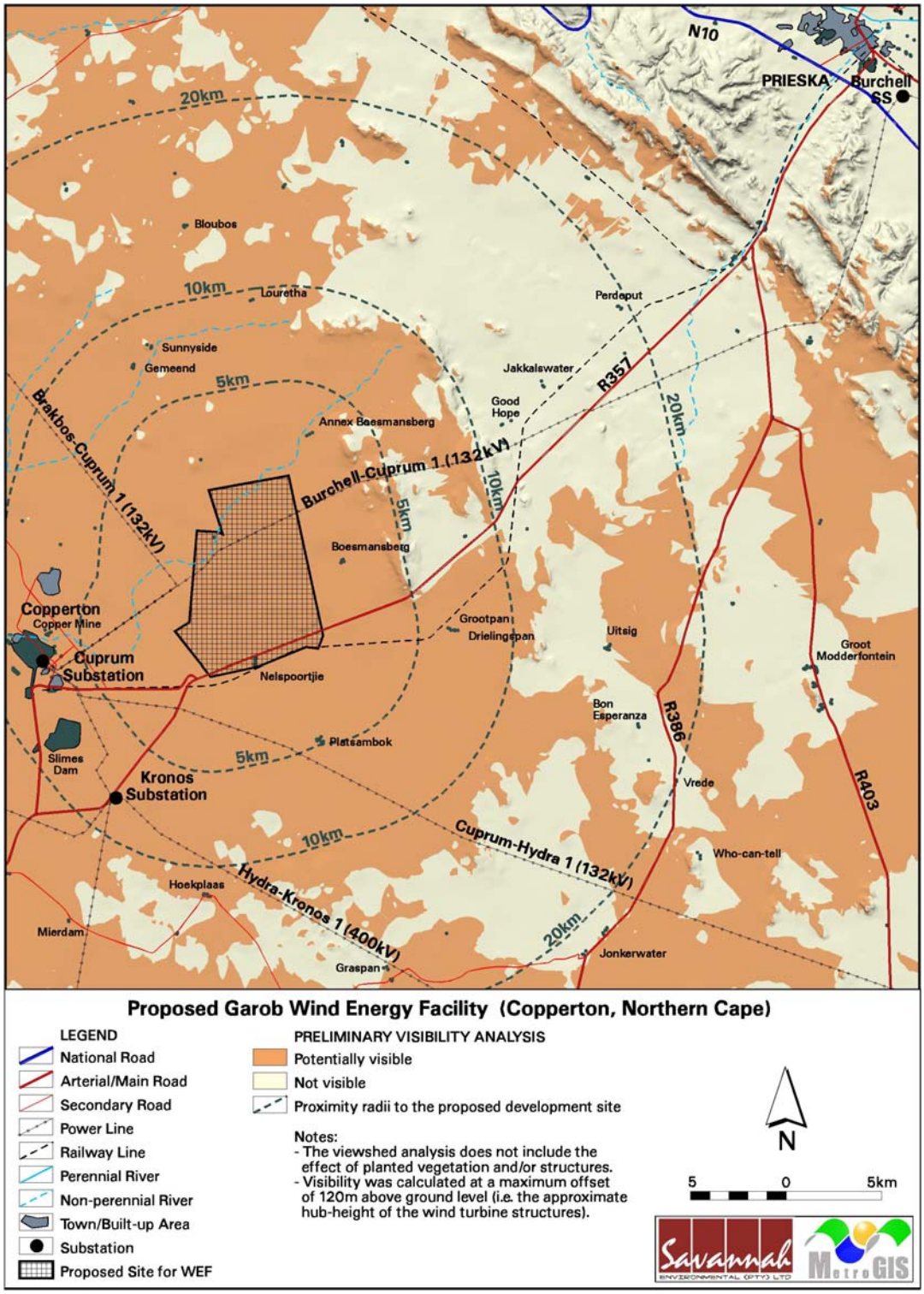


Figure 8.1: Viewshed analysis for the proposed Garob Wind Energy Facility. The visible area indicates areas from which *any portion* of the PV facility may be visible.

This was done through viewshed analyses which were undertaken from a number of vantage points within and along the perimeter of the proposed development area at an offset of 100m (i.e. the approximate hub height of the proposed wind turbines) above average ground level. This was done to determine the general visual exposure of the area under investigation, simulating the proposed turbine structures associated with the facility. It must be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario

Impacts on Avifauna:

The main issue associated with the operation of a wind farm in terms of avifaunal impacts relates to the potential for collisions with the blades. Multiple factors influence the number of birds killed at wind farms. These can be classified into three broad groupings: bird related information; site related information and facility related information.

Although only one study has so far shown a direct relationship between numbers of birds present in an area and number of collisions (Everaert, 2003, Belgium) it stands to reason that the more birds flying through the area of the turbines, the more chance of collisions occurring. The particular bird species present in the area is also very important as some species are more vulnerable to collision with turbines than others. Bird behaviour and activity differs between species – with certain hunting behaviours rendering certain species more vulnerable. For example a falcon stooping after prey is (possibly) too focused on its prey to notice the presence of infrastructure. There may also be seasonal and temporal differences in behaviour, for example breeding males displaying may be particularly at risk

While all birds face some inherent risk of impact by wind turbines, there are definitely certain groups that are more at risk due to their flight behavior or habitat preferences (Jordan & Smallie, 2010). These authors summarized knowledge from the European Union, United Kingdom, United States, Canada and Australia to identify the following taxonomic groups as being affected most by wind energy facilities: *Podicipediformes, Pelicaniformes, Ciconiiformes, Anseriformes, Falconiformes, Charadriformes, Strigiformes, Caprimulgiformes, Gruiformes, Galliformes, Psittaciformes, Passeriformes*. In determining which species are likely to be at risk at wind energy facilities in South Africa, the above groups form a useful starting point.

Site information

Landscape features can potentially channel or funnel birds towards a certain area, and in the case of raptors, influence their flight and foraging behaviour. Elevation, ridges and slopes are all important factors in determining the extent to which an area is used by birds in flight. High levels of prey will attract raptors, increasing the time spent hunting, and as a result reducing the time spent being observant. Certain sites are also vulnerable to poor weather such as mist, which may influence the bird collision risk.

Facility information

According to Kingsley & Whittam (2005), “More turbines will result in more collisions”. Although only two mortalities have been recorded at Klipheuwel, the difference between the 3 turbines at Klipheuwel and the proposed project at Garob is significant and largely renders comparisons and extrapolations meaningless. Larger facilities also have greater potential for disturbance and habitat destruction, and displacement of birds from the area. With newer

technology and larger turbines, fewer turbines are needed for the same quantity of power generation, possibly resulting in fewer mortalities per MW of power produced (Erickson et al, 1999).

Lighting of turbines and other infrastructure has the potential to attract birds, thereby increasing the risk of collisions with turbines. Erickson et al (2001) suggest that lighting is the single most critical attractant leading to collisions with tall structures. Changing constant lighting to intermittent lighting has been shown to reduce attraction (Richardson 2000) and mortality (APLIC, 1994; Jaroslow, 1979; Weir, 1976) and changing white flood light to red flood light resulted in an 80% reduction in mortality (Weir, 1976).

Infrastructure associated with the facility often also impacts on birds. Overhead power lines pose a collision and possibly an electrocution threat to certain bird species. Furthermore, the construction and maintenance of the power lines will result in some disturbance and habitat destruction. New access roads, substations and offices constructed will also have a disturbance and habitat destruction impact

The three main hypotheses proposed for birds not seeing turbine blades are as follows (Hodos, 2002):

» An inability to divide attention between prey and obstacles. This seems an unlikely explanation as birds have been found to maintain good acuity in the peripheral vision, have different foveal region in the eye for frontal and ground vision and they have various other optical methods for keeping objects at different distances simultaneously in focus.
» The phenomenons of motion smear or retinal blur.
» The angle of approach. If a bird approaches from side on to the turbine, the blades present a very small profile and are even more difficult to detect.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Collisions of birds with turbines	Collision with turbine blades	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species, especially marine birds that breed along the	Cannot be determined at this stage.

		coastline.	
Habitat loss – destruction, disturbance and displacement	Habitat loss – destruction, disturbance and displacement due to operation of the facility	Local	Cannot be determined at this stage.
Impacts of associated infrastructure	Due to electrocution with associated power lines as well as the maintenance of substations, power lines, servitudes and roadways. This causes both temporary and permanent habitat destruction and disturbance.	Local to Regional. -the impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species, especially marine birds that breed along the coastline.	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

Any inaccuracies in the sources of information could limit this study. In particular, the SABAP1 data is now fairly old (Harrison et al, 1997), but no reliable more recent data on bird species presence and abundance in the study area exists, since SABAP2 coverage is not yet adequate for formal use for this study. This study relies entirely upon secondary data sources with regards to bird abundances such as the SABAP1 (Harrison et al, 1997). However, primary information on bird habitat was collected during the site visit and is used directly in determining which species are likely to occur where on site.

The number of turbines to be constructed and the position of associated infrastructure has not yet been finalized, but it is assumed that this information will be available in the EIA Phase.

Recommendations:

The EIA phase will emphasise the outcome of the site visit, which in turn will include:

» The micro habitats on site will be assessed for their suitability for the key species
» The sensitivity zones and suitable buffer zones will be identified and mapped.

» The impacts identified in this scoping phase study will be assessed formally
» If a pre-construction bird monitoring programme has not already been initiated, a framework for such a monitoring programme will be prepared.

Impacts on bats:

The entire site is predicted to have a low bat sensitivity and no specific feature or habitat type can be isolated or identified from available data that may indicate a higher presence of bats in such an area. The site does not display the three factors of possible roosting space, surface water and probability of insects strongly, suggesting that it is unlikely to have a high bat activity. Of the 35 species reported to occur in the province, one is considered Vulnerable, five Near Threatened, 28 Least Concern, and one is Data Deficient according to the IUCN Red List criteria.

A number of factors influence the number of bats disturbed and/or killed at windfarms. These can be classified into three broad groupings:

» facility related information – physical damage to the bat caused by actual collision with the turbines;
» site related information – alterations to the bats prey-base during and after construction, as well as changes in roost site availability;
» bat related information – the barotrauma that operating turbines can cause to bats.

There is a concern of bats and possible wind turbine blade collisions/barotrauma. Wind turbines cause local changes in air pressure. While bats are able to detect the relatively slow pressure changes caused by approaching storms, they are not able to detect the sudden drops in pressure caused by wind turbines. These sudden pressure changes cause the rapid expansion of the lungs and the bursting of the fine capillaries around the edges of the lungs, leading to the death of the bat, a process known as 'barotrauma'

Issue	Nature of Impact	Extent of Impact	'No go' areas
Bat mortalities due to blade collisions and barotrauma	Rotating turbine blades	Regional - The impact will occur at the site of the proposed wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and	Cannot be determined at this stage.

		may affect migration routes of species	
Habitat Destruction	Habitat destruction stemming from the concrete foundation of the turbines, access roads and associated infrastructure	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» No site visit was conducted during the scoping phase and information is limited to species reported to occur in the area. No knowledge is available on buildings and other infrastructure present on the site, all of which could provide roosting or feeding facilities for bats.

Recommendations:

Information for the EIA phase will be collected using the following monitoring techniques:

» Species presence estimates determined through the use of a bat detector system operated while walking transect lines across the farm;
» Surveys that will assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites, trees, will be carried out. Further investigation will be done if any areas with high potential on or adjacent to the site are identified. These surveys will be done during the daytime, including dusk and dawn periods conducted at all infrastructure currently present on the farm.

The following will be included in the EIA phase:

» A site visit will be conducted for the EIA phase of this project to more accurately determine bat presence.
» A site visit is needed to provide more guidance regarding the appropriate positioning of the turbines correctly as well as to deal with the details of the associated infrastructure that was not provided at this stage of the process.
» A monitoring program is seen as critical in extending knowledge of wind energy and bat interactions. It is recommended that a monitoring program be planned to collect data on a host of environmental factors.

Potential Heritage Impacts:

Potential impacts on heritage resources as a result of the operation of the wind farm relate to visual impacts on areas around heritage structures and cultural landscapes, as well as impacts on sense of place. The heritage scoping study revealed that the following heritage sites, features and objects that can be expected within the study area:

- Archaeological finds
- Historical finds
- Burials and Cemeteries

Issue	Nature of Impact	Extent of Impact	'No go' areas
Built environment	Physical structural appearance of the wind farm.	Local	No 'no- go' areas have been identified at this stage.
Cultural landscapes and sense of place	Physical structural appearance of the wind farm.	Unknown at this stage of impact assessment	No 'no- go' areas have been identified at this stage.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

The study area was not subjected to a field survey as this will be done in the EIA phase. It is assumed that information obtained for the wider area is applicable to the study area

Recommendations:

During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

- Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
- The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon, ensuring that all the requirements of SAHRA are met.

Potential noise impacts:

Increased noise levels can directly be linked with the various activities associated with the operational phase of the activity. During this evaluation, more focus was placed on the impacts on the surrounding noise environment during times when a quiet environment is highly desirable. Noise limits should therefore be appropriate for the most noise-sensitive activity. Noise-sensitive activities such as sleeping, or areas used for relaxation or other activities (places of worship, school, etc) should determine appropriate Zone Sound Levels. However, for the noise Scoping report the $L_{Req,N}$ of **35dBA** as proposed by SANS 10103 was used.

The most common sources of noise during the operational phase include:

» Aerodynamic noise, which is emitted by a wind turbine blade (sound of the wind turbine "cutting" wind – low frequency noise)
» Mechanical noise (from the gear-box / generator)
» Transformer noises (substation)
» Transmission Line noise (Corona noise)
» Low frequency noise
» Amplitude modulation of the sound emissions from the wind turbines

The worst case scenarios as indicated in the noise study (Appendix J) illustrates the situation where atmospheric conditions are favourable for sound propagation, with the wind speeds above the cut-in speeds of the Wind Turbine Generator (WTG), but before wind induced noises start to mask the noises from the WTG.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts associated with the operation of the wind farm	The noise will be a combination of the cumulative effects of up to 55 wind turbines operating at night. Based on the preliminary impact estimations (as detailed in the noise specialist report contained within Appendix J) there are potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.	Regional (i.e. beyond the site boundaries). The noise could impact on receptors within the potential area of influence (worst case scenario – wind blowing from wind farm towards receptor).	An appropriate buffer around identified sensitive receptors- to be confirmed in the EIA phase

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is no information available regarding the existing soundscape of the area.
» Projected impacts from the construction phase can only be modelled once more information regarding the duration of construction and equipment used are known.

Recommendations:

It is recommended that the potential noise impact associated with the facility be investigated in more detail in the EIA Phase. The following information is considered critical:

» The prevailing night-time background ambient noise levels,
» The available meteorological data,
» The exact locations of the various wind turbine generators within the development footprint,
» The full specifications of the wind turbine generators,
» The confirmation of the noise-sensitive developments, and;
» An overview of the equipment, processes and schedules for the construction phase.

The following work is planned for the EIA Phase:

» A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying Noise-sensitive developments,
» Currently identified (potential) Noise Sensitive Developments (NSDs) will be investigated during the EIA phase, and any additional NSDs will be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).
» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the facility on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for both the construction and operational phases, as well as the ISO 9613-2 model for the operational phase.
» Using the calculated noise levels at the identified NSDs, the projected significance of the facility (whether construction or operational) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed facility.

Potential Social Impacts:

During the operation phase the potential exists for further, albeit limited, job creation and some skills development (positive impacts). However, there is also the potential for impacts on the social dynamics of the study area. The proposed project could assist with decreasing South Africa's dependency on coal generated electricity thereby strengthening the electricity grid in an "environmentally friendly" way. On a regional scale it could possibly result in positive changes in the quality of lives of many individuals currently living without an efficient and satisfactory electricity supply. On a national scale, the proposed project would also assist in meeting the South African government's target for renewable energy.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential impacts on existing tourism and tourism potential of the area	This is considered to be low as the area is not seen as a tourist destination	Local-regional	N/A
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	Impact closely linked to visual impacts, associated with turbines and associated infrastructure, the power lines proposed.	Local-regional	N/A
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services	(Positive impact)	Local and Regional	N/A
Potential up and down-stream economic opportunities for the local, regional and national economy	(Positive impact)	Local, Regional and National	N/A
Provision of a clean, renewable energy source for the national grid	(Positive impact)	Local, Regional and National	N/A

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» Census, or on sources based projections on the Census 2001 data. The writing of this report coincides with Census 2011 – the first comprehensive community level count undertaken since 2001. An interim Community Survey was undertaken by StatsSA in 2007 (Local Municipal level). However, Census 2001 remains the most recent community/ ward level, actual count data currently available. Final data from Census 2011 will be available in early 2013. Therefore, it should be noted that the 2001 Census data is dated. Where possible this data has been up-dated by projections, derived from Census 2001. While this data does provide useful information on the demographic profile of the affected area, the actual data is dated and should be treated with care.

Recommendations:

Methodology to be undertaken for the EIA phase:

» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented.

The following typical, generic project information is required in order to inform the Social Impact Assessment (Including all related infrastructure such as transmission lines, access roads, office and warehouse components):

» Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report;
» A draft illustration (plan) of the proposed lay-out(s) of the wind turbines (including an indication of the phasing sequence on the site), supporting structures and infrastructure;
» Number of people employed during the construction phase;
» Breakdown of number of people employed in terms or low skilled, semi-skilled and skilled;
» Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

CONCLUSIONS CHAPTER 9

The Garob Wind Farm is proposed to be located on portion 5 of the Farm Nelspoortje, south of the mining town of Copperton (~ 5520 ha in extent) (refer to Figure 9.1). The wind energy facility is proposed to have a generating capacity of up to 140 MW and will accommodate up to 55 wind turbines appropriately spaced to make use of the wind resource on the site.

Infrastructure associated with the wind energy facility is proposed to include:

» Wind turbines of between 2 – 3MW in capacity with a hub height of up to 120m and a rotor diameter of up to 120m
» Concrete foundations to support the turbines
» Cabling between the turbines, to be laid underground where practical, which will connect to an on-site substation
» An on-site substation to facilitate the connection between the wind energy facility and the electricity grid
» A new overhead power line. Two power line options are proposed; Option 1 would be to connect to the existing Burchell Cuprum 132 kV power line that crosses the site while Option 2 will be to connect to the existing Eskom Cuprum substation approximately 8 km from the site.
» Internal access roads to each turbine (approximately 6 m in width) linking the wind turbines and other infrastructure on the site. Existing roads will be used as far as possible
» Workshop area / office for control, maintenance and storage

The Scoping Study for the proposed **Garob Wind Farm** has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This project was registered with the National Department of Environmental Affairs under application reference number **14/12/16/3/3/2/279.**

This Draft Scoping Report is aimed at detailing the nature and extent of this facility, identifying potential issues associated the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs). In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives (including the “do nothing” option) have been identified for consideration within the EIA process.

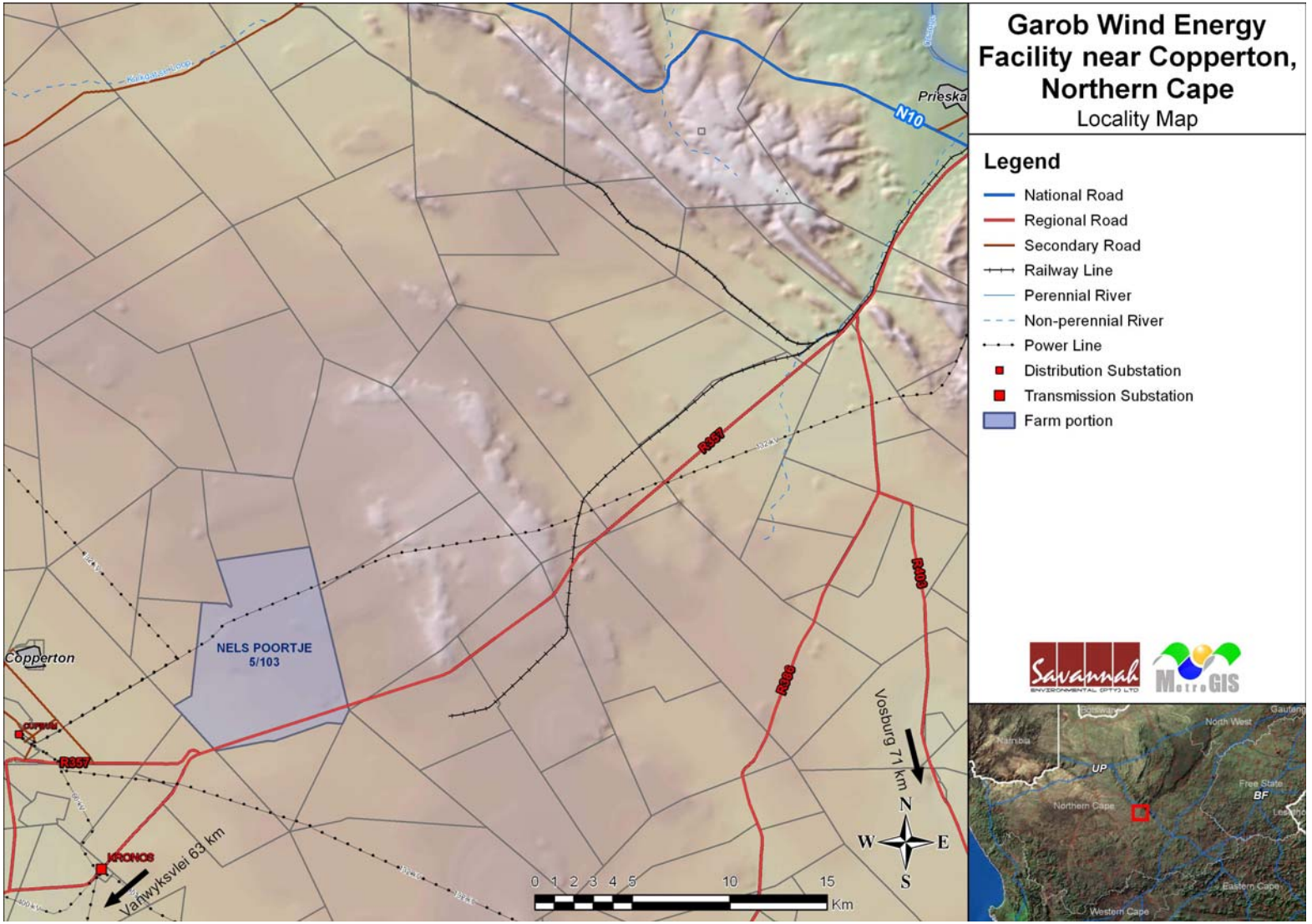


Figure 9.1: Locality map showing the study area for the establishment of the Garob Wind Farm located on Nelspoortje Farm, portion 5 of the Farm 103 within the Siyathemba Local Municipality (Northern Cape)

The conclusions and recommendations of this Draft Scoping Report are the result of on-site inspections, desk-top evaluations of impacts identified by specialists, and the parallel process of public participation.

A summary of the conclusions of the evaluation of the potential impacts identified to be associated the proposed wind farm and associated power line is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 10 of this report.

9.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of the proposed Wind Farm

In identifying and evaluating impacts associated with the proposed wind energy facility, it has been assumed that although during operation, the area affected will comprise of up to 55 (depending on which turbine types are ultimately chosen by the developer), access roads and a substation(s), during construction much of the approximately 5520 ha of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (estimated at approximately 5%) will be permanently impacted by infrastructure associated with the wind energy facility.

General potential issues identified through this scoping study associated with Garob Wind Farm are summarised in Tables 9.1 and 9.2. The majority of potential impacts identified to be associated with the construction and operation of the proposed wind energy facility are anticipated to be local to regional in extent. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity such as potential noise sensitive receptors, bird and bat sensitive areas, drainage lines and habitats for protected flora and fauna were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figure 9.2.

Table 9.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Garob Wind Farm

Impacts resulting from the Construction/ Decommissioning Phase	Positive /Negative Impact	Extent
Potential visual impacts associated with the construction phase	-	L
Potential visual impact of the construction of ancillary infrastructure on observers in close proximity	-	L
Loss of agricultural land (anticipated to be low to negligible, it will still have to be investigated)	-	L
Soil degradation due to contamination	-	L
Soil erosion due to increased and concentrated storm water run-off	-	L
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	-	L
Siltation of watercourses and other natural resources down stream	-	R
Dust production		
Habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems.	-	L
Alien plant invasion, habitat fragmentation and loss of landscape connectivity	-	L
Destruction of bird habitat	-	L
Disturbance of birds	-	L
Displacement of birds from the site and barrier effects	-	L-R
Destruction of foraging habitat and roosts for bats	-	R
Impact on archaeological finds	-	L
Impacts on historical finds	-	L
Impacts on burials and cemeteries	-	L
Noise impacts due to construction equipment	-	L
Noise impacts due to construction traffic	-	L
Impact on rural sense of place	-	L
Impact on tourism, both locally and regionally	-	L-R
Impact on farming activities	-	L

Impacts resulting from the Construction / Decommissioning Phase	Positive / Negative Impact	Extent
Influx of job seekers into the area	-	L
Employment creation	+	L
Skills development and training	+	L-R
Promotion of clean, renewable energy	+	L-R

L **Local** R **Regional** N **National** I **International**

Table 9.2: Potential impacts associated with the Operational Phase with all three phases of the proposed Garob Wind Farm

Impacts resulting from the Operational Phase	Positive / Negative Impact	Extent
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads (i.e. the R357, R386 and R403) and secondary roads in close proximity to the proposed facility and within the region.	-	L
The potential visual impact on the town of Copperton.	-	L
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region.	-	L
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	-	L
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	-	L
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	-	L
Potential cumulative visual impacts of the wind farm and associated infrastructure.	-	L
Collisions of birds with turbines	-	R
Habitat loss for Avifauna as a result of destruction, disturbance and displacement	-	L
Impacts of associated infrastructure on Avifauna	-	L-R
Bat mortalities due to blade collisions and barotrauma	-	R
Habitat Destruction		
Heritage impacts associated with the built environment	-	L
Impacts on the cultural landscapes and sense of place	-	Unknown
Noise impacts associated with the operation of the wind farm	-	R
Potential impacts on existing tourism and tourism potential of the area	-	L-R
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	-	L-R
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services	+	L-R

Impacts resulting from the Operational Phase	Positive / Negative Impact	Extent
Potential up and down-stream economic opportunities for the local, regional and national economy	+	L-N
Provision of a clean, renewable energy source for the national grid	+	L-N

L **Local** R **Regional** N **National** I **International**

The potentially sensitive areas/environmental features that have been identified include:

» **Drainage lines within the site:**
There are a number of drainage lines that occur on the site. These are considered to be of high sensitivity. According to the National Water Act, dry stream beds and drainage areas (including non-perennial streams) are classified as wetlands or water resources. Drainage lines/ non-perennial streams provide habitat for a number of plant/animal species in the study area, including those with a restricted distribution or species with an elevated conservation status. Drainage lines (water resources) represent particularly vital natural corridors as they function both as wildlife habitat, providing resources needed for survival, reproduction and movement, and as biological corridors, providing for movement between habitat patches. The drainage lines and pans shown in the desktop sensitivity map have been mapped at a desktop level. The actual extent will be mapped from field work during the next phase of the assessment.

» **Potential habitat for protected flora and fauna:**
The gravel or stony outcrops on site are likely to be dominated by low woody shrubs. These are likely to be of medium ecological sensitivity due to higher plant and animal diversity. This will however be verified in the field work during to be conducted in the next phase of the assessment.

» **Potential bird sensitive areas:**
The proposed facility could have an impact on selected avifauna species resident to the surrounding area. A possible impact of the facility will be displacement effects on, and collision mortality on selected avifaunal species. These priority species may be disturbed by the construction of the wind energy facility, and/or lose foraging habitat (in terms of the area covered by the construction footprint), and/or sustain mortalities in collisions with, or electrocution on the new power infrastructure. Surface water areas on site have been identified as potential habitats for avifauna and should be avoided.

» **Noise sensitive Receptors**
The construction and operation of the wind energy facility will have potential impacts on noise sensitive receptors within the proposed development. The buffer around these receptors will be recommended during the EIA phase based on site conditions (to be verified in the EIA phase).

The sensitivity map is a rough scale estimate of sensitivity on the site, and these areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated

and assessed through detailed specialist studies (including field surveys) during the EIA phase.

The proposed design of the wind energy facility (i.e. wind turbines and other infrastructure) can be based on the full extent of the site, and therefore utilise the most technically optimal positions on the broader site to the fullest extent. This recommendation does, however, require that due cognisance is taken of the recommendations outlined in Chapter 8 and above (as well as within individual specialist reports) regarding areas within the study site of potential moderate to high sensitivity. Understanding which area of the site would be least impacted by the development of such a facility, juwi should prepare the detailed infrastructure layouts for consideration within the EIA phase.

9.2. Evaluation of the Potential Issues associated with the overhead power line

In order to connect the renewable energy facility to the power grid, two connections options are proposed.

» Option 1: to connect to the existing Burchell Cuprum 132 kV power line that crosses the site
» Option 2: to connect to the existing Eskom Caprum Substation approximately 8 km from the site.

Potential issues associated with the proposed overhead distribution power lines will include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

The power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred alternative alignment and appropriate mitigation measures).

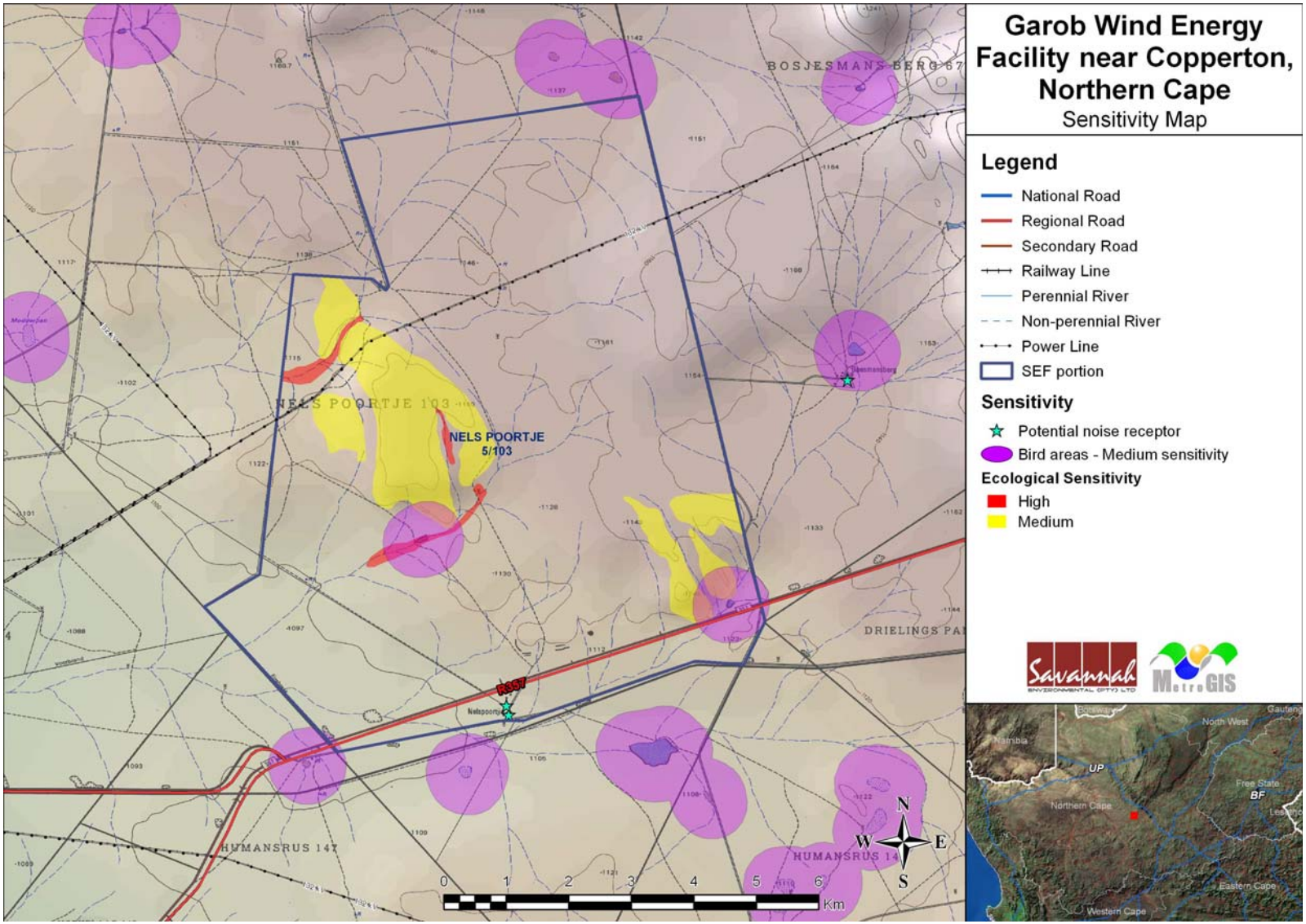


Figure 9.2: Desktop environmental sensitivity map for the proposed Garob Wind Farm showing areas/environmental features of potentially high and medium sensitivity (as provided by specialists at scoping).

PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 10

A detailed description of the nature and extent of the proposed Garob Wind Farm and associated infrastructure, details regarding the Scoping Phase followed, as well as the issues identified and evaluated through the Scoping phase (to date) have been included in this Draft Scoping Report. This section of the report provides the context for a Plan of Study for Environmental Impact Assessment (EIA).

The Plan of Study describes how the EIA Phase for the proposed wind energy facility project will proceed. The EIA Phase of the study includes detailed specialist studies for those impacts recorded to be of significance as well as on-going public consultation. The key findings of the Scoping Phase (which includes inputs from authorities, the public, the proponent and the EIA specialist team) are used to inform the Plan of Study for EIA, together with the requirements of the NEMA EIA Regulations and applicable guidelines.

10.1. Aims of the EIA Phase

The EIA Phase will aim to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed project.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed wind energy facility and associated infrastructure.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA will address potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction, operation and decommissioning, and will aim to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project. All identified feasible alternatives (including the 'do nothing' alternative) will be assessed.

10.2. Authority Consultation

Consultation with the regulating authorities (i.e. DEA and DENC) will continue throughout the EIA process. On-going consultation will include the following:

» Submission of a Draft Scoping Report to DENC and other relevant Organs of State for review and comment. A 40-day review period will be allowed as per the requirements of NEMA.
» Submission of a Final Scoping Report to DEA following a 30-day public review period.
» An opportunity to visit and inspect the site.

10.3. Consideration of alternatives

The following project alternatives will be investigated in the EIA:

» **The 'do nothing' alternative:** juwi Renewable Energies (Pty) Ltd does not establish the proposed Garob Wind Farm (maintain status quo).
» **Site-specific alternatives:** particularly the layout of the wind turbines and corridors/servitudes for associated infrastructure such as the access roads and power line.
» **Alternative technologies:** for use in the establishment of the wind energy component of the facility.
» **Alternative servitudes for power line routing:** Network integration studies, planning and design for the transmission of the power generated at the wind energy facility is still being finalised. This will be informed through understanding the local power requirements and the stability of the local electricity network. However, in order to connect the renewable energy facility to the power grid, two power line options are proposed. Option 1 would be to connect to the existing Burchell Cuprum 132 kV power line that crosses the site while Option 2 will be to connect to the existing Eskom Cuprum substation approximately 8 km from the site. The power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred alternative alignment and appropriate mitigation measures.

10.4. Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

A summary of the issues which require further investigation within the EIA phase, as well as the proposed activities to be undertaken in order to assess the significance of these potential impacts is provided within Table 10.1. The

specialists involved in the EIA Phase are also reflected in Table 10.1. These specialist studies will consider the site proposed for the development of the wind energy facility and all associated infrastructure (including alternatives with regards to design, layout, as well as the alternative alignments of access road/s and power line.

Table 10.1: Summary of the issues which require further investigation within the EIA phase and activities to be undertaken in order to assess the significance of these potential impacts

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Impact on Ecology	<u>Vegetation</u> The following terms of reference are applicable to the Impact Assessment Phase of the project: » Carry out fieldwork to locate and describe the vegetation on the study area, key focus on the impact footprint. » Determine the species present and localities within each vegetation type present. » Generate a vegetation map showing the sites in relation to any Critical Biodiversity Areas and links to ecological corridors and support areas. » Determine whether the study area falls wholly or partially within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected. » Provide a description of the current state of the vegetation on site supported by relevant photographs. » Identify and describe the conservation value and conservation planning frameworks relevant to this site (Regional Planning) for represented vegetation units. » Describe the areas where indigenous vegetation has been transformed. » Determine alien species present; their distribution within the study area and recommended management actions. » Note and record the position of protected or unusually large specimens of trees. » Provide a detailed vegetation sensitivity map (e.g. CBA) of the site, including mapping of disturbance and transformation on site. » Provide monitoring requirements as input into the Environmental Management Plan (EMP), as well as generic rehabilitation and re-vegetation guidelines. <u>Fauna</u> The following terms of reference are applicable to the Impact Assessment Phase of the project: » Describe and assesses the terrestrial fauna present in the area that will be affected by the proposed development. » Conduct a faunal assessment that can be integrated into the ecological study.	Simon Todd of Simon Todd Consultancy

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» Describe the existing impacts of current land use as they affect the fauna. » Clarify species of special concern (SSC) and that are known to be: * endemic to the region; * that are considered to be of conservational concern; * that are in commercial trade (CITES listed species); * or, are of cultural significance. » Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.	
Impacts on avifauna	The EIA Phase will include the following activities: » The micro habitats on site will be assessed for their suitability for the key species, » The sensitivity zones and suitable buffer zones will be identified and mapped. » The impacts identified in this scoping phase study will be assessed formally according to a standardised impact assessment criteria. » If a pre-construction bird monitoring programme has not already been initiated, a framework for such a monitoring programme will be prepared. » Provide monitoring requirements as input into the Environmental Management Plan (EMP)	Jon Smallie of Wild Skies Ecological Services
Impacts on bats	The EIA Phase will include the following activities: » A site visit be conducted for the EIA phase of this project to more accurately determine bat presence. » A site visit will provide more guidance regarding the appropriate positioning of the turbines correctly as well as to deal with the details of the associated infrastructure that was not provided at this stage of the process. » A monitoring program is seen as critical in extending knowledge of wind energy and bat interactions. It is recommended that a monitoring program be planned to collect data on a host of environmental factors. This should be initiated as soon as possible to ensure robustness of data. » It is recommended that static monitors be placed on the meteorological mast as soon	Claire Patterson-Abrolat and Megan Diamond Endangered Wildlife Trust (EWT)

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	as possible so that pre-construction monitoring data can be gathered to better inform the construction and operational phases. » Provide recommendations for input into the Environmental Management Plan (EMP)	
Impacts on geology, soils and agricultural potential study)	The EIA Phase will include the following activities: » Determination of land capability, current land-use and degradation status of the agricultural resources (i.e. soil and vegetation) » Determination of geology and soils, with special reference to sensitivity to erosion and factors contributing to erosion (i.e. slopes, etc.) » Determining the Climate of the site » Identifying agriculturally sensitive areas or areas with high agricultural value (i.e. lands, wetlands and watercourses) » Identifying agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, etc.) that will be impacted upon	Louis George du Pisani and Theunis Gert Coetzee of EDUPLAN CC
Visual impacts	The potential sensitive visual receptors should be identified and the severity of the visual impact assessed within the EIA phase of the project. Photo simulations of critical viewpoints should be undertaken, in order to aid in the visualisation of the envisaged visual impact. The following activities will be undertaken: » Determine Viewer Incidence/Viewer Perception: The number of observers and their perception of a structure determine the concept of visual impact. » Determine the Visual Absorption Capacity (VAC) of the landscape:: This is the capacity of the receiving environment to absorb or screen the potential visual impact of the proposed facility. » Determine the Visual Impact Index » The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur.	Lourens du Plessis of MetroGIS
Impacts on heritage resources	In order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment will be undertaken. During this study the following will be conducted: » Sites of archaeological, historical or places of cultural interest will be located,	Jaco Van der Walt of Heritage Contracts and Archaeological Consulting CC

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	identified, recorded, photographed and described. » The levels of significance of recorded heritage resources will be determined and mitigation proposed » Should any significant sites be impacted upon recommendation will be made to ensure that all the requirements of SAHRA are met.	
Noise impacts	The following will be conducted during the Environmental Impact Assessment phase: » A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying noise-sensitive developments, » Currently identified (potential) Noise Sensitive Developments (NSDs) will be investigated during the EIA phase, and any additional NSDs will be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial). » Using the data (proposed processes, noise characteristics of the selected equipment, locations of the Wind Turbine Generators) as provided by the project developer, the predicted impact of the wind energy facility on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for both the construction and operational phases, as well as the ISO 9613-2 model for the operational phase. » Using the calculated noise levels at the identified NSDs, the projected significance of wind energy facility (whether construction or operational) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed facility.	Morné de Jager of M^2 Environmental Connections
Social Impact Assessment	The following will be conducted during the Environmental Impact Assessment phase: » Identification of key interested and affected parties, specifically landowners; » Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc; » Identification and assessment of the key social issues and opportunities;	Tony Barbour (Environmental Consultant and Researcher)

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented. »	

10.5. Methodology for the Assessment of Potential Impacts

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified will be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» the **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» the **status**, which will be described as either positive, negative or neutral.
» the degree to which the impact can be reversed.
» the degree to which the impact may cause irreplaceable loss of resources.
» the *degree* to which the impact can be *mitigated.*

The **significance** is determined by combining the criteria in the following formula:

S=(E+D+M)P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
» 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

juwi Renewable Energies (Pty) Ltd has the responsibility to avoid or minimise impacts, and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts will be discussed. Assessment of impacts with mitigation will be made in order to demonstrate the effectiveness of the proposed mitigation measures.

The results of the specialist studies and other available information will be integrated and synthesised by the Savannah Environmental project team. In addition, the cumulative impacts associated with the proposed development in addition to other proposed facilities in the area will be assessed. The EIA Report will include:

» **detailed description** of the proposed activity
» a description of the property(ies) on which the activity is to be undertaken and the location of the activity on the property(ies)

- a description of the **environment that may be affected by the activity** and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity
- details of the **public participation process** conducted, including:
  - steps undertaken in accordance with the plan of study for EIA;
  - a list of persons, organisations and organs of state that were registered as interested and affected parties;
  - a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response to those comments; and
  - copies of any representations, objections and comments received from registered interested and affected parties
- a description of the **need and desirability** of the proposed project and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity
- an indication of the methodology used in determining the **significance** of potential environmental impacts
- a description and comparative **assessment of all alternatives** identified during the environmental impact assessment process
- a summary of the findings and recommendations of **specialist reports**
- a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- an assessment of each identified potentially significant impact
- a description of any assumptions, uncertainties and gaps in knowledge
- an environmental **impact statement** which contains:
  - a summary of the key findings of the environmental impact assessment; and
  - a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives
- a draft **environmental management programme (EMP)**
- copies of specialist reports

The draft EIA Report will be released for a 30-day public review period. The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the final EIA Report, for submission to the authorities for decision-making.

10.6. Public Participation Process

A public participation process will be undertaken by Savannah Environmental in accordance with the requirements of the EIA Regulations. Consultation with key stakeholders and I&APs will be on-going throughout the EIA process. Through this consultation process, stakeholders and I&APs will be encouraged to provide input to the project, and to comment on the findings of the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities will be provided for stakeholders and I&APs to be involved in the EIA phase of the process, as follows:

» Public meeting (advertised meeting for members of the general public).
» Focus group meetings (pre-arranged and stakeholders invited to attend).
» One-on-one consultation meetings (for example on request by stakeholders or I&APs).
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.

The draft EIA report will be made available for public review for a 30-day period prior to finalisation and submission to the DEA for review and decision-making. In order to provide an overview of the findings of the EIA process and facilitate comments, a public feedback meeting will be held during this public review period.

10.7. Key Milestones of the programme for the EIA

The envisaged key milestones of the programme for the EIA phase of the project are outlined in Table 10.2.

Table 10.2: Envisaged key milestones of the programme for the EIA phase of the project

Key Milestone Activities	Timeline
Public review period for Draft Scoping report	30-day public review period from 07 June 2012 – 09 July 2012
Submission of Final Scoping Report to DEA	July 2012
Authority acceptance of the Environmental Scoping Report and Plan of Study to undertake the EIA	30-days after receiving the Final Scoping Report
Make draft EIA Report and draft EMP available to the public, stakeholders and authorities	30-day public review period
Final EIA Report to DEA for review and decision-	Within 105 days after receiving the

making, and issue of an Environmental Authorisation	Final EIA report.

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